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London J.E.A. Charges

Equity and Expediency

THE decision of the London and Home Counties J.E.A. to raise its cooker-hire charges and to surcharge all consumers 10 per cent. on their electricity bills was no doubt arrived at with as great reluctance as its 125,000 consumers will exhibit in paying their larger bills. As we stated last week, the Electricity Commissioners, quite rightly of course, insisted that the Authority should conform to the canons of public electricity supply finance whatever the effect might be. Those rules stipulate that loans raised in respect of domestic appliances shall be redeemed in seven years and according to the Authority a considerable proportion of the loan charges which it bears are in respect of capital expenditure incurred on apparatus hired out to consumers, chiefly electric cookers.

Other major considerations are the expenditure upon meters (10-year loans) and the comparatively heavy burden which the Authority is bearing in the redemption of capital raised for the purchase of the undertakings which it acquired. These undertakings, moreover, were not in an advanced state of development and the Authority has had to spend a great deal on distribution—particularly in new housing areas. By reducing the charges for electricity and hiring out appliances at low rates the Authority has encouraged the extended use of electricity. But this reduction has gone too far to enable it to meet all its charges as they have fallen due and the result has been an accumulated deficit—£153,500 by the end of this year.

Reasonable Tariffs

Were the existing charges too low? The Authority's distribution area is divided into two zones. In the outer zone the lighting flat rate is 6d. per kWh (7d. for prepayment meters), the charges in the inner zone being 5d. and 6d. respectively. In both zones the heating flat rate is 2½d. for the first 3,000 kWh, falling to 2d. for the next 18,000, 1½d. for the next 21,000 and 1d. thereafter. The charge for cooking is 1d. in the summer and 1½d. in the winter. For the two-part tariffs the fixed charge is based on the size of house and the "unit" charges are ¾d. in summer and 1d. in winter for the outer zone and ½d. and ¾d. in the inner zone.

It will be seen that the tariffs, while reasonable, are by no means among the lowest in the London and Home Counties area. In fact it is the complaint of many consumers that those in bordering districts are much better off. Most of the places in the inner zone are fairly compact residential areas—by no means rural. In the outer zone there are stretches of country, but due allowance is made for this in the differentiated charges. The revenue from energy sold by the Authority in 1936-37, the latest comparable figure available, was 1.72d. per kWh. For municipal undertakings in the London and Home Counties district the figure was 1.20d. and for companies 1.25d.

The experience of the County of London Company, which we mention later, suggests that lower charges might have encouraged greater use to such an extent as to increase the net surplus considerably.

Uneconomic Rentals

There is no doubt, however, that hitherto the cooker-hire charges have been far too low, which means that people with their own cookers as well as those who do not cook electrically have been paying more for electricity than they should have done. Unfortunately this inequity is to be continued, for existing cooker-hire contracts are to go on at the old rates—only newcomers will be affected. At the end of May last about 25,000 cookers had been let out on hire. If the new rates, which are double the old ones, are on a truly economical basis 20 per cent. of the consumers are to continue to be subsidised by the remainder who will have to find the difference.

The doubling of the charges will inevitably put a brake on development. Is it likely that many people will be content to pay the new hire rentals when they have neighbours who are asked to pay only half as much? The position created is an impossible one and so far as we can see the only bright spot is that private traders may be able to sell more cookers outright.

We do not blame the Authority for the general predicament in which it finds itself for it has done well during its short life. Both it and its consumers are the victims of special circumstances and because of that the consumers are called upon to bear a heavier burden than they should—perhaps for the benefit of posterity. Many of them may well ask with the poet, "But what has posterity done for us?" and refuse to carry the load, thus, paradoxically, diminishing the load of the J.E.A.

Better News

WHILE the J.E.A.'s consumers will be worse off they will perhaps be pleased to hear that many people in other areas in the Home Counties and Dorset are to be charged less for their electricity. The County of London Electric Supply Co., Ltd., and some of its subsidiaries are reducing the running charge of their two-part tariff from 1d. to ¾d. per kWh. As the districts concerned are for the most part truly rural, including the peaceful Elham Valley, the reduction is something of an achievement. The County Company and its associates have been pursuing this enlightened policy for some years now and apparently find it profitable. They have proved, as many other undertakings have done, that greater sales mean greater profit and that too great caution cramps development. To cast your bread upon the waters in this way is not a speculation or such thoroughly commercial enterprises as the County Company would not do it.

Good Hearing

ATTENDANCE at the meetings of the Institution of Electrical Engineers during the forthcoming winter session is likely to beat all records, not only because of the normal growth of interest, but because the Institution announces that for the first time all those who attend may count on being able to hear what the speakers have to say. The I.E.E. lecture theatre has long been recognised as acoustically bad and after many promptings the Council has now decided to install a microphone at the lecture table and loudspeaker for the use of lecturers, authors and speakers at discussions. A statement is made that a reasonably uniform speech level will be maintained and we presume that a form of automatic control of volume recently applied to public address systems will be utilised, so as to ensure that wide variations in speech intensity at the microphone will be corrected in the speech amplifier and output from the loudspeakers. No doubt in the design of the amplifier provision will also be made to render the microphone insensitive to very low levels of sound so as to avoid the tendency to pick up extraneous noise and sounds other than those of the voice addressing the audience. This improvement will rank with the controlled electric heating and the veto on individual thanks to authors.

Events in Australia

Two matters of importance to British electrical manufacturers are reported from Australia. One is the publication of the consulting engineers' recommendations on an electrical development scheme for New South Wales which, on the basis of the next ten years' needs, is estimated to cost £23,000,000. The formation of a Central Electricity Authority with duties analogous to those of our own C.E.B. is suggested for the more densely populated part of the State. Large extensions of power plant, hydro-electric schemes, the construction of a network of transmission lines and the electrification of four main railways are proposed. The report is not the first of its kind. The recent rapid expansion of electrical requirements in the State, however, makes a unified power plan essential and the prospects of the report being acted upon must be much greater than with its predecessors. The second item relates to Queensland and deals with a policy which has been advocated but not adopted in our own country, namely, prohibition of the sale of electrical fittings which do not conform to specific requirements, in this case of the Standards Association of Australia. The Government is expected to introduce a regulation to this effect shortly, the immediate consequence of which should be an improved market for high-quality equipment.

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Rural Potentialities

WHEN areas are canvassed by supply authorities quite frequently the results do not justify the cost of extending the mains, although the possible load is adequate. That some allowance has to be made for over-caution on the part of inhabitants is indicated by the results achieved at Nelson. When the undertaking obtained powers to supply a number of additional townships it was estimated that 123 consumers would be connected. As the scheme proceeded, however, other applications were received, and there was a substantial demand for electric cookers. Thus a much larger scheme was found to be necessary, and instead of the small loss expected on the first year's working a profit has been made after meeting all charges.

Modern Alchemy

IN their endeavour to discover "identity behind diversity" the mediævalists made a sound approach towards scientific matters. Their ideal, symbolised in the philosopher's stone, has now—it would not be too far-fetched to say—found material form in the cyclotron, the technical basis of which formed the subject of an article by Dr. F. T. Wall in our issue of July 8th. The first example to be put into service in Great Britain, we believe, will be the one nearing completion at Liverpool University for atomic research under the direction of Professor J. Chadwick. That is its primary purpose, but it is to be hoped that it may ultimately aid in the production of artificial radium.

Erith Enterprise

A STRIKING fact which Mr. E. A. Logan, the electrical engineer and manager at Erith, brings out in his annual report is that eight out of every ten persons coming to reside in new property in the district apply for electric cookers. The reason for this is that last year the Department instituted an attractive hire scheme and also offered to install electric cookers free on payment of a unit charge of one penny for all electricity used. No practical difficulties have been found in the working of the scheme. Mr. Logan states, and the results prove that provided the terms are competitive the electric cooker is the popular choice. At Erith there continues to be considerable activity in house building, so that the gain in domestic load is substantial, and this should be enhanced by the water-heater hire scheme which is being introduced. The beneficial effects of the enterprise in the way of employment are widespread. The Department's transport fleet has had to be increased; a comprehensive maintenance scheme will be required later; further sub-station plant is needed; and local contractors are given the installation work.

Our Domestic Issue

THE ELECTRICAL REVIEW'S annual survey of the domestic electrical appliance field will appear on October 7th. The trend of development and the latest equipment for lighting, heating, cooking, water-heating and labour saving will again be reviewed and the issue will include a number of articles by authors well qualified to deal with their subjects. Particular attention will be given to the opportunities for the electrical contractor-retailer in the domestic sphere and the issue will form a valuable guide to supply authorities as well as to the individual reader.

A Tour in North Wales

What I.E.E. members will see

This week-end a party of members of the Transmission Section of the Institution of Electrical Engineers is being shown over the North Wales Power Company's area, in which there is a good deal of interesting electrical work set in attractive surroundings. The itinerary is set out in this article

THOUGH somewhat belated—it usually takes place in May—the annual outing of the Transmission Section of the Institution of Electrical Engineers nevertheless attracted about eighty participants (under the leadership of Mr. J. L. Eve, retiring Chairman of the Section) wishing to refresh their impressions of the developments going on in parts, at least, of the 4,080 square miles constituting the area of the North Wales Power Co., Ltd., which also exercises certain powers transferred to it by the North Wales and South Cheshire Joint Electricity Authority.

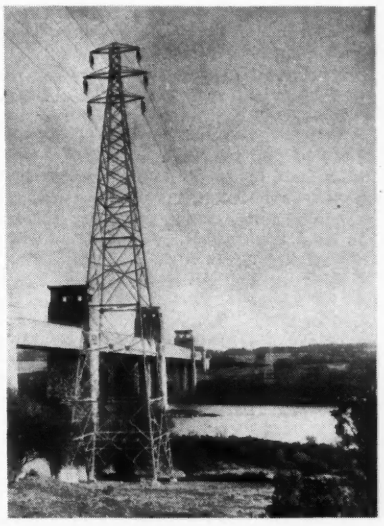
Members and their ladies are assembling this week-end at the Grand Hotel, Llandudno, whence they will undertake two motor coach tours, the first westward along the coast road by way of Penmaenmawr, whose 1,550 ft. summit has been almost entirely removed as the result of quarrying operations by the Penmaenmawr and Welsh Granite Co., Ltd., with the aid of electricity purchased from the Power Company's mains and distributed from four sub-stations. The connected load is 4,000 h.p., including one of the largest electric navvies in the country and a 400-h.p. crusher with jaw dimensions of 54 in. by 72 in., both of which machines are perched 1,000 ft. above sea level.

Penrhyn slate quarry, showing galleries 60 ft. high and 20 ft. wide

Just beyond the village of Aber is the demonstration farm of the University College of North Wales, frequently miscalled "Bangor University," which has recently been extensively equipped with such electrical appliances as a threshing machine, milking machines, milk-cooling equipment, motor pumps, &c., and it is annually visited by large numbers of North Wales and Cheshire farmers desiring to familiarise themselves with the latest mechanisation methods.

A deviation at Llandegai southwards through Bethesda will permit a mid-morning inspection of the Penrhyn Slate Quarries. About a mile after leaving Llandegai the road passes under a new 33-kV overhead transmission line connecting the Dolgarrog power station with Bangor and Anglesey; it includes the longest span on the company's system, viz., 2,101 ft. at Aber Falls. The Penrhyn slate quarries, which have been operated for more than 300 years and are reputed to be the largest in the world, are worked on the open gallery system, each gallery being 60 ft. high and 20 ft. wide. For identification purposes the 21 galleries are named, generally, after some historical incident which occurred at the time of their opening. For instance, the Crimea gallery was opened at the time of the Crimean War and, similarly, work was commenced on the Sebastopol gallery during the campaign of 1854. Looking at the quarry working face, which is 14 miles long and 1,200 ft. deep, one sees, as visibly as if painted, the different strata of rock standing out in distinct lines of colour and angles.

About 50 miles of tramway and 6 miles of private railway are worked in the exploitation of the slate, the chief operations being: (1) slate getting; (2) slate dressing; (3) removal of debris. The first operation is mainly carried out by hand and aided by local blasting. In the slate dressing sheds 3,760 h.p. of electric motors, supplied with energy from the North Wales Power Co.'s mains, drive the saw tables, cutting the slabs into suitable blocks, which are then split by hand and trimmed by means of revolving knives. The removal of debris is a great problem, as about 90 per cent. of the slate quarried is waste. Over a million tons is thrown on the Penrhyn tips annually. A portion of the waste is now utilised, after being crushed into powder of 300 mesh of fineness, as a filler ("Fullersite") for bitumen, rubber, paint, &c.

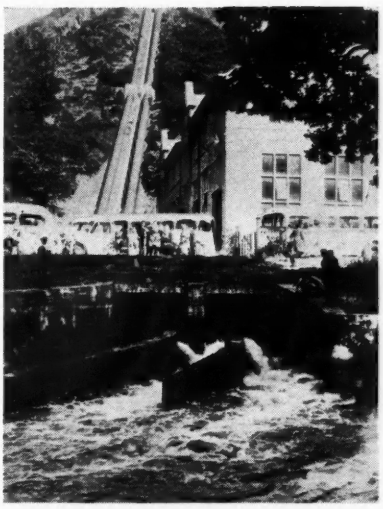


The Menai Strait crossing of the Bangor-Holyhead line from the Anglesey side with Britannia Bridge in background

Proceeding through the city of Bangor and crossing the Menai Strait at noon by the suspension bridge, there is to be observed about a mile away the double circuit 33-kV overhead line span of 1,550 ft. (with conductors 100 ft. above high water) conveying the main supply of electricity across to the Isle of Anglesey. This has recently been supplemented by an 11-kV submarine cable.

The island is very sparsely inhabited; about one person per five acres, or one premises per sixteen acres. There are five market towns and a number of small seaside resorts, but grasslands are the chief means of livelihood, farm animals being reared in large numbers. Nevertheless, the island is being rapidly developed electrically and more than £100,000 has already been spent on this enterprise. Pumping is being adopted extensively, since the lack of natural catchment areas makes water supply a big problem on the island.

Soon after crossing the strait one reaches Llanfair P.G. (the full name has 58 letters) where is situated one of the principal 33/11-kV sub-stations, tapped off one of the dual circuits of the main transmission line; the other circuit is similarly tapped further along the Holyhead road, at Gaerwen where the second sub-station is. The main 33-kV line continues almost parallel with the road, about a mile south-westward, terminating at Caergeiliog where the voltage is stepped down to 11 kV primarily for direct supplies to Holyhead (L.M. & S.

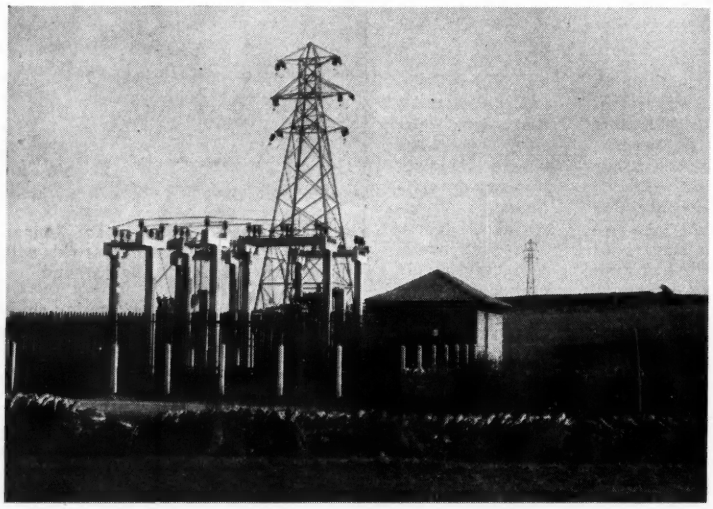


The Maentwrog hydro-electric station, showing the two h.p. pipelines and tailrace

Railway's harbour works and in bulk to the Town Council) and, secondarily, for local distribution by the Power Company.

After luncheon at the Cliff Hotel, Trearddur Bay, provided by the Power Company, the party will re-cross Anglesey eastward in order to inspect the B.B.C. transmitting station at Penmon, another of the Power Company's consumers; the local studio is on the mainland at Bangor (see ELECTRICAL REVIEW, p. 204, February 5th, 1937) and the programmes are transmitted by landline. The station was the first of this type to be built by the B.B.C., and the site was decided upon after numerous tests, having regard to the attenuation of signals and the population it served.

The aerial output is 5 kW and the wavelength of 373.1 metres is the same as that of the transmitter at Washford, and is



The Caergeiliog sub-station near Holyhead with termination of 33-kV line

kept in synchronism by an electrically maintained tuning fork which is controlled by a master crystal at Washford over landline connection. One of the most conspicuous features of the station is the 250 ft. mast aerial mounted on circular insulators and topped with a 40-ft. diameter capacity ring and red aircraft warning light. In the machine room motor generators provide filament heating and grid bias supplies and two pumps, connected in parallel, circulate the valve cooling waters. The power is derived from the North Wales Power Company's 11-kV transmitting mains.

There should be time for a short visit to Beaumaris Castle (built by Edward I, who substituted the descriptive French place name for the earlier one of Bonover) after tea at the Bulkeley Arms Hotel, by courtesy of the Power Company, on the way back to Llandudno by the coast road.

The object of the second day's trip, by a more south-westerly route beside the River Conway, is to visit two of the Power Company's three hydro-electric generating stations. Proceeding along the east bank of the River Conway the route passes through Llanrwst, whence a new 11-kV overhead line is about to be constructed to Bettws-y-Coed as a consequence of the absorption of the local Council's undertaking. The Power Company's No. 1 overhead 11-kV line (originally constructed in 1905) passes close to the road near the summit of "The Crimea" pass, whence Maentwrog reservoir can be observed. This is the largest artificially formed sheet of inland water in North Wales, having an area of about two square miles. It forms the storage for Maentwrog power station to which the visitors will descend, passing on the way down the large Oakely slate quarries in which 2,500 h.p. of electric motors is installed, these underground workings contrasting with the Penrhyn open quarries.

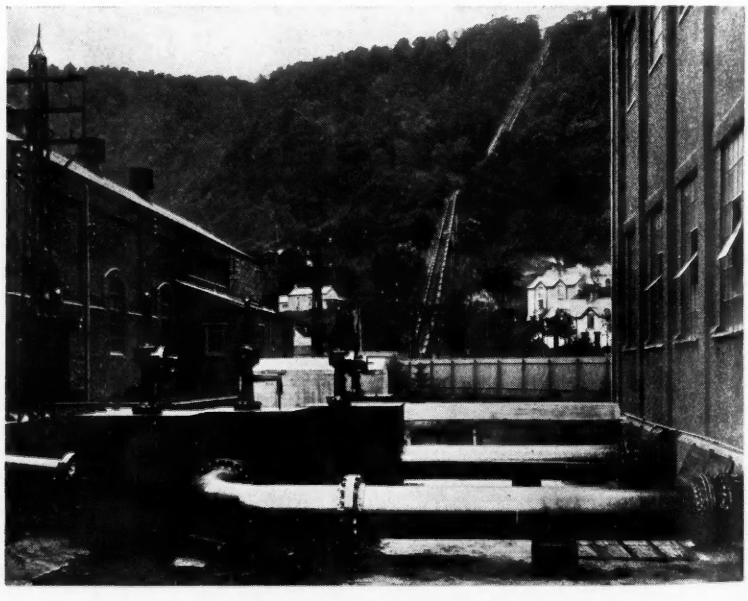
The Maentwrog plant, just above sea level, is the nearest to the coast. It derives water from 15,000 acres draining to the Afon Prysor, across which the main dam and spillway were constructed at 650 ft. o.d. to form a reservoir of 1,200 million cu. ft. A tunnel and one steel pressure pipe orginally conveyed water down to the first three machines of 6,000 kW each completed in 1928 (they were described in the ELECTRICAL REVIEW of October 26th, p. 699, and November 2nd, 1928, p. 743). A second pressure pipe and fourth 6,000-kW generating set were added in 1934.

The party will return to Bettws-y-Coed for luncheon as the guests of the J. L. Eve Construction Co., Ltd., and will then proceed to the Dolgarrog power station, *via* Llanrwst Bridge and Trefriw. One of the two 4-ft. diameter power pipelines down the hillside is new, replacing the old 3-ft. pipe. It is now substantially complete and, in conjunction with the 6-ft. low-pressure pipeline nearly three miles in length installed last year, will enable the full hydraulic pressure of Lakes Cowlyd and Eigiau to be utilised, viz., 1,200 ft., which is the greatest head so far employed in this country for electricity generation. The pipelines were erected by the J. L. Eve Co.

At Dolgarrog are the works of the Aluminium Corporation, Ltd., where aluminium oxide is reduced in electric furnaces and the refined metal is rolled into thin sheets and foil. The Corporation established d.c. hydro-electric plant in 1907. With the formation of the British Power & Light Corporation (1929), Ltd., the whole of the hydraulic works and generating stations at Dolgarrog were acquired by the Power Company in 1929.

The average rainfall of 85 in. per annum represents an output of well over 50 million kWh in a normal year. The initial a.c. plant consisted of two Armstrong Whitworth turbines, each of 7,500 h.p. overhung Pelton type, coupled to English Electric three-phase alternators of 5,000 kW at 6,600 V, 50 cycles. The more recently installed third set is of the high speed Boving double runner impulse type with four jets developing 10,000 h.p. at 600 r.p.m. The alternator is similar to the others, except that its framework is fabricated and its normal output is 6,500 kW. The a.c. installed capacity at the company's three hydro stations is 47,000 kW and the energy generated and purchased last year was 145 million kWh. The maximum demand on the system was 35,700 kW and the connected load approximated to 74,000 kW.

The number of sub-stations exceeds 600, including those of the pole type. The higher voltages employed range from 66 down to 3.3 kV and the length of transmission lines operated by the Power Company exceeds 970 route-miles, with an addition of 239 miles of secondary, high-voltage lines owned by the associated Electricity Distribution of North Wales and District, Ltd. The latter's sales last year were 16,795,851 kWh, while to its 42,400 direct consumers must be added 60,000 more who are served by seventeen local authorities and one other company which purchase energy in bulk. These



View of the Dolgarrog station and pipelines

eighteen authorised concerns last year took 42,700,000 kWh.

While the capital expenditure of the Power Company, which exceeds four millions sterling, has increased relatively slowly since the generating stations and main transmission systems were established, that of the Distribution Company has been at the rate of over £80,000 annually for the last six years and will soon reach a million pounds.

Repainting Outdoor Transformers

OUTDOOR transformers with radiators fitted with plain, gilled, or other type of cooling tubes, are usually very difficult to repaint satisfactorily by the ordinary method, and frequently even by spraying, on account of the inaccessibility of the surfaces. The alternative is to flood the surfaces to be coated with liquid paint and drain off the surplus, a method described recently in the *Asea Journal*. The company has worked out a procedure and designed suitable equipment.

The "flood" method

The most difficult part of such work is cleaning the iron surfaces. Under ordinary circumstances, treatment with strong lye solution has proved satisfactory, the warm lye being swilled over the transformer until all paint and oil is removed, after which the plant is washed with clean water. If there has been heavy rusting, further treatment is then necessary with a solution consisting of 0.44 lb. ferrous sulphate dissolved in 2.2 lb. of hydrochloric acid. This solution penetrates into the pores of the rust film, and the soluble iron compounds formed can be easily rinsed away with the rest of the "pickling" solution, by clean water.

A thoroughly satisfactory paint coating can be ensured in spite of any slight rust film by employing an undercoating relatively rich in oil and containing organic acids, which will ensure a sufficiently thick basis layer of paint on top of the thin film of rust. At the same time such a paint mixture has a chemical action on the rust, which is first loosened and combined with the acids to form saponaceous iron compounds, which are innocuous and finally become bound together with the ground coating as one of its natural constituents.

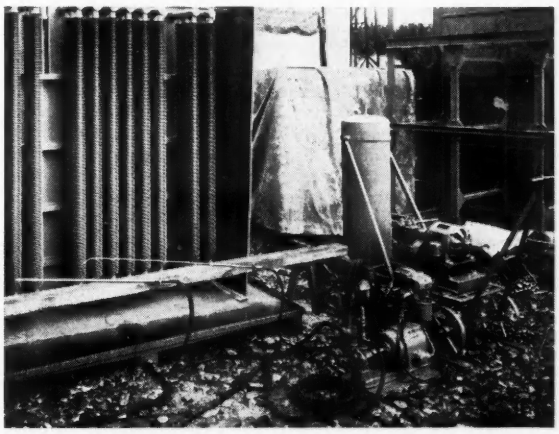
It is important to coat all surfaces on which rust tends to form most readily with a sufficiently thick film of the special paint. This is easily ensured, as such surfaces are horizontal ones, and when flooded with paint it is on the horizontal surfaces that a thicker film of paint naturally collects. When the undercoating is thoroughly dry, two finishing coats are applied, the first being allowed to dry completely before the second one is applied.

The equipment required includes an air compressor set and a pump, both driven by ordinary three-phase squirrel-cage motors. A tray placed under the work to catch any surplus paint is drained by means of a connection to the pump.

The quantities required for "flood" repainting a 3,000-kVA transformer are given below. The particular transformer was fitted with corrugated cooling gills, and as a result of the pockets so formed the amount of paint used was considerably more than would have been required if gills of plain flat strip material had been employed:—

Caustic potash (77lb.) approx. 3½ oz. per sq. metre.
Hydrochloric acid (11lb.) approx. 0.7 oz. per sq. metre.
Undercoating (brown, 319lb.) approx. 17½ oz. per sq. metre.
Finishing coats (grey, 506lb.) approx. 26½ oz. per sq. metre.
Thinning medium, mineral turpentine (Sangajol, 440lb.) approx. 21 oz. per sq. metre.

When there is heavy rusting some ferrous sulphate will be required in addition to the foregoing, but the cheapest quality is quite suitable. Finally, there must be sufficient cleaning water available. The transformer can remain *in situ* throughout the repainting process and thus none of the connections need be disturbed. Provided properly qualified personnel can be on the spot, practically all the preliminary work can be carried out while the transformer is still in use. The bushings, thermometer, calcium chloride breather, or any other parts which might be damaged by the lye, acid, or water, should be carefully protected by wrapping with tar-paper and all apparatus, including the metal nozzles, earthed in a satisfactory manner. The lye is made up with warm water, about 2¼ lb. for every 3 gal. The rust remover is prepared in a special container made of acid-resistant sheet metal, 4¾ oz. of ferrous sulphate being added to every lb. of concentrated hydrochloric acid. In the lid of the container there is a connection for compressed air, and at the bottom another for attaching the rubber tubing leading to the nozzle.



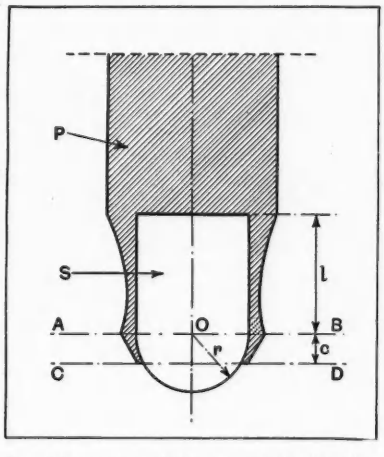
View of complete equipment ready for use

Provided this treatment is continued long enough all rust can be removed in this way without recourse to brushing. It is necessary to neutralise the last traces of lye solution, which can never be completely washed away simply by rinsing with water. This is done by a further swilling with water containing 0.5 per cent. hydrochloric acid, which is allowed to act for 10-15 min. and is blown off with compressed air.

Painting should not be attempted when the temperature is below 15 deg. C. and the surfaces must be perfectly dry. The inside of the pump, collecting tray, nozzles and tubes must also be perfectly dry, since the same equipment is used for applying the paint as for the lye.

Experience with Sapphire Meter Pivots

THE accompanying illustration from the *Revue Générale de l'Electricité* shows the construction of a sapphire pivot adopted as standard by the Compagnie d'Electricité de l'Ouest Parisien after extensive trials. The sapphire S is let into the steel spindle P of the meter and retained by swaging the lip between the lines AB and CD.



Sapphire meter pivot as used by the Cie. d'Electricité de l'Ouest Parisien

Only the extremity of the spherical end, near the sapphire bearing-cup, protrudes and this is polished so highly that no striation can be seen under a magnification of 50 diameters. Sapphire pivots of this type are fitted to all new and repaired meters and it is stated that more than 100,000 of them are now in use.

It is impossible, says G. Grunberg, to rely upon steel bottom pivots for more than one or two years, after which serious error may arise from roughening of the bearing surface, though in some instances satisfactory performance may be obtained for much longer periods. Whether the deterioration of steel pivots is due to abrasion or to attack by oxygen from the sapphire has not been proved, but the author considers that reliability cannot be guaranteed with or without lubrication. On the other hand, the accompanying table, summarising the results of observations on 200 meters in normal service with sapphire pivots for a period of five years, shows virtually 100 per cent. reliability, the wear being either incapable of measurement or much smaller than that of steel pivots under similar conditions, and in no case sufficient to affect the running of the meter at light loads.

PERFORMANCE OF SAPPHIRE METER PIVOTS.

Meter Rating.	5 A. 115 V.	15 A, 2×115 V.
No. of meters examined	100	100
Spindle revolutions in 5 years:		
(*a*) Mean	2,630,000	4,550,000
(*b*) Maximum	4,250,000	14,000,000
No. of meters showing no appreciable wear on pivots and bearings	67	50
Mean diametral wear on remaining:		
Sapphire pivots	0.029 mm. (1.1 mil.)	0.036 mm. (1.4 mil.)
Sapphire bearings	0.033 mm. (1.3 mil.)	0.030 mm. (1.2 mil.)
Steel pivots after revolutions as at (*a*)	0.17 mm. (6.7 mil.)	0.21 mm. (8.3 mil.)

The Czechoslovakian Electrical Industry

Its growth and present position

AT the twentieth annual congress of the Czechoslovakian Electrotechnical Association (E.S.C.) held at Prague and attended by some 750 persons, including many delegates from Poland, Rumania, Yugoslavia, Denmark, Sweden, France, Holland and other countries there were presented fifty-three papers by Czechoslovakian, Rumanian and Yugoslav authors, the full text of which has now been published in book form.* Also, as this occasion marked the completion of twenty years' work by the Association, commencing with the establishment of the republic and based on the foundations laid by the old Association of Czech Electrical Engineers, there has been published a commemorative volume reviewing the electrical development of Czechoslovakia, Yugoslavia and Rumania during the past twenty years, and providing a useful survey of present electrical practice and activities in those countries.†

Activities of the Electrotechnical Association

In a foreword to the historical review, Ing. Maxmilian Cizek, president of the E.S.C., refers particularly to the value of the work done by the Association in promoting and co-ordinating the activities of all branches of the electrical industry in Czechoslovakia, and in formulating standards and specifications advantageous to manufacturers and purchasers alike. The active participation of the E.S.C. in international organisations is a matter of common knowledge. Its domestic activities include the maintenance of a proving organisation and the issue of an approval mark, which is at present granted to the products of seventy-four manufacturers. Among the many publications issued by the Association special interest attaches to the propaganda journal *Elektris*, 300,000 copies of which are purchased every two months by electricity undertakings for free distribution to their consumers.

Special attention is drawn to the value of the Karlsbad branch of the E.S.C. in promoting co-operation between the Czechoslovak Association and the German Association of Electricity Works, and a further and more extensive indication of the scope for international collaboration is provided by the allocation of much space to technical and statistical reviews of electrical development in Rumania (32 pages) and Yugoslavia (36 pages). These reviews are believed to be the best sources yet available for information on the growth and present position of electricity generation and distribution in Rumania, hydro-electric developments in Yugoslavia, the electrical organisations and associations of the latter country and its electrical educational facilities. Certain electrical manufactures, particularly of electrolytic copper, lamps, primary and secondary cells and installation material, are well established in Yugoslavia, and the rapid growth in electrical imports and the wealth of raw materials are alike indicative of the scope for expansion in manufactures.

More than two-thirds of the volume reviewing the period 1918-1938 is devoted to electrical developments in Czechoslovakia. Excellent descriptions are given of the training facilities available at the Czech Institute of Technology, Prague, the Edvard Benes University, Brünn, the Hochschulen at Prague and Brünn, and the many technical schools which meet admirably the needs of the various grades of the industry.

Power Supply System

Legislation providing for systematic electrification of the country was introduced in 1919, and the accounts now given by chief engineers and others in responsible positions show what great progress has already been achieved and how well the arrangements provide for future expansion. A network of transmission lines connects the thermal and hydro-electric stations, adding to national security by reducing the dependence on mines near the frontier, besides paving the way for greater utilisation of lignite in the manufacture of oils and chemicals.

While there is at least 1,250,000 kW of power available from Czechoslovak rivers (about 17 per cent. developed at present), the capabilities of high-pressure steam stations have not been neglected. Much pioneering work has been accomplished in research and manufacture and there are in service ten boilers working at 1,850-lb. pressure and supplying turbo-generators totalling 125,000 kW.

Other fields on which valuable information is given concerning recent developments in Czechoslovakia include the electrification of collieries, with substantial reductions in power costs; industrial electric driving, well advanced in all branches; domestic electrification, now accounting for about 7 per cent. of the total kWh generated, and expected to be more than doubled during the next 10 years; electric traction, exclusively d.c., covering all classes of rail and road transport, and including plans for solving the traffic problems of Greater Prague; sub-station equipment, with notable examples of mercury rectifiers and extra-high-speed circuit breakers; all branches of an electrical industry which competes effectively in world markets; the research and testing establishments which have contributed to this progress; and individual classes of electrical equipment, such as machinery, transformers, switchgear, protective gear, meters, instruments, insulators and material for transmission and distribution systems.

Technical Problems

With so highly developed and extensive an industry as a background, the papers presented at the recent Congress merit most careful attention, dealing, as they do, with many problems and developments of current importance to electrical engineers in all countries. All the papers in the reports volume are printed in the language in which they were delivered, but summaries are given in almost every instance, either in French or German. It is impracticable here to mention all the papers presented under the seven headings; machines, apparatus, central stations, traction and hoisting, heating and lighting, testing and research, and weak current applications. We have, however, examined the whole of this volume and commend it as a really substantial addition to modern electrical literature. The following notes relate to some of the more striking features.

Readers interested in mathematical treatment will appreciate the contributions on losses in induction motors, short-circuit calculations, tariff framing, economics of lighting, accuracy in meter testing, and certain characteristics of magnetic and electrical fields. Progress in construction is reviewed by papers on improvement in insulation, uses of plastic moulding compounds, the balancing of rotors, flameproof enclosures, motors of various types, transformers with special reference to improvements in efficiency and reduction in costs, electroplating dynamos, pressure-built static condensers, and the trend of economical manufacture, particularly of motors, generators, transformers and switchgear. As regards operating problems, there are papers on "killing" the fields of alternators, static condensers for p.f. correction, the breaking capacity of switchgear, improvement of commutation, earth-leakage trip and other methods of protection against shock, automatic and remote control systems, protective gear, and power station practice with regard to different fuels and various steam conditions

Industrial Applications

Applications of electricity to agriculture, oil fields, traction and colliery winding are dealt with, and there are papers on transmission costs. The enormous potentialities of electric heating loads are indicated by a series of papers on: (1) Applications of arc welding in Rumania to machine construction and repair and in structural work; with notes on the activities of the Timisoara Welding Development Association. (2) Uses of electric heating in electrochemistry, electrometallurgy and other industries, with typical performance data; concluding with observations on the desirability of standardising electrical furnaces and carrying out systematic investigations into individual sources of loss in different types of furnaces. (3) Statistical analyses of developments in heating loads. (4) Practical requirements in hot-water storage, the present state of development and the relative advantages of various types of storage apparatus. (5) Electric heating applications in textile industries, with many data on the ratings of equipment. Finally, there are papers on subjects of such diverse and topical interest as sirens for A.R.P., street lighting in relation to accidents, and the manufacture of gramophone records.

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* "XX. Sjezd E.S.C., Praha 1938: Prednasky." 11¾ by 8¼ in. Pp. 261; illustrated. Prague: Elektrotechnicky Svaz Ceskoslovensky.

† "XX. Sjezd E.S.C., Praha 1938: Elektrotechnika v Ceskoslovensku, Jugoslavii av Rumunsku." 11¾ by 8¼ in. Pp. 273; illustrated. Prague: Elektrotechnicky Svaz Ceskoslovensky.

Marine Engineers' Examinations

NEW regulations relating to the examination of engineers in the mercantile marine for certification by the Board of Trade have been issued (H.M. Stationery Office, price 1s.). They embody changes in the examination system and syllabuses, including electrotechnology, introduced in accordance with the recommendations of a departmental committee which reported on the subject last year. The very full information given includes lists of textbooks and approved technical schools where day and evening classes are available.

Fruit Canning in Sussex

Electricity assists a rural industry

But for the availability of electricity this essentially rural industry would almost certainly not have been developed in its existing convenient, healthy and pleasant surroundings in the heart of Sussex

THE facility with which electricity can be transmitted and applied just where it is required no longer makes it so necessary or desirable for factories to be situated in towns or industrial centres. Apart from numerous manufacturing concerns which are finding it advantageous both from the economic and health points of view to move out of the towns, many essentially rural industries can now, with the aid of electricity, be developed without moreover, any fear of causing atmospheric pollution from smoke, fumes, etc.

A case in point is to be found a mile or so from the little Sussex village of Horsted Keynes, where the Mid Sussex Canning & Preserving Co., Ltd. (proprietors: The St. Martin Preserving Co., Ltd.) has established a completely electrified fruit canning factory. Gathered largely in the immediate neighbourhood, the fruit has the minimum of travelling to do and reaches the factory perfectly fresh and whole.

Cherries are stoned by an ingenious "pitting" machine (left) driven by a 1-h.p. motor. Right: Picking over blackcurrants after "strigging" in the electrically operated machine on the right

Arriving at the receiving department the fruit goes according to its nature to an appropriate section of the factory for picking and grading. Soft fruit is dealt with on a long picking table incorporating a continuously moving belt driven through a variable pulley drive by means of a 2/3-h.p., 1,400 r.p.m., shunt-wound B.T.H. motor.

For hard fruit, such as plums and gooseberries, two different kinds of grading machines are available operating on entirely different principles. In one, which is driven by a 2-h.p., 750-r.p.m., shunt-wound B.T.H. motor, an endless wire running on pulleys backwards and forwards the length of the machine is so arranged that the spaces between the various turns become larger towards one end. Fruit fed in at the "small" end is thus shaken along these wires until the space between is large enough for it to pass through to be collected in receptacles beneath. The other type of grader embodies various sized vibrating screens which deliver the fruit in four different sizes on to continuous belts. This machine is driven by a 2 h.p., 1,000 r.p.m., shunt-wound Crompton Parkinson motor with a 4/1 reduction.

Strigging Blackcurrants

Two quite different types of equipment are also used for "strigging" blackcurrants. In the machine illustrated the currants are fed on to an inclined board through slots in which come at intervals four pairs of steel fingers. These revolving in opposite directions tear off the strigs. A 3-h.p., 1,000-r.p.m., shunt-wound Crompton Parkinson motor provides the motive power. A small lath conveyor driven by a 2-h.p. motor is used in the other type of strigger to carry the currants between a brush and a revolving rod with spikes on it.

Other types of fruits also need special preparation before they are ready for canning. Gooseberries, for instance, have to have their "whiskers" removed. This is done by two "snibbers" which, driven through shafting from a 4-h.p., 1,420-r.p.m., totally enclosed, shunt-wound motor, operate on the same principle as a potato peeler, the whiskers being rubbed off on an abrasive material which lines the container. Cherries, too, have to be stoned and for this purpose the ingenious "pitting" machine (1-h.p., 380-r.p.m.) illustrated is employed. The fruit is placed in a hopper at the top and each of the recesses in a revolving drum receives a cherry as it passes under the outlet of the hopper. Synchronised punches then push the stones right out into the centre of the drum, the fruit itself falling into a container at the side of the machine. Apples can be dealt with at the rate of twenty-eight a minute by means of a peeler and corer driven by a ¼-h.p. Higgs motor.

Finally, ready for canning, the fruit is taken to one end of a filling table which runs practically the whole length of the factory. A conveyor passing down the centre of this table is driven by a 2-h.p., 1,150-r.p.m., shunt-wound motor (G. Hopkins & Sons), *via* a chain driven on a 30/1 reduction gear. On reaching the end of the conveyor the filled tins are transferred to another conveyor at right angles which takes them across to the other side of the factory for the addition of syrup, which is supplied from tanks at 140-150 deg. F.

A slight cant of the conveyor gives the head space required and the tins pass on to the clincher which automatically places on the lids (picked up by suction) and makes them secure but not tight. The cross conveyor and the clincher, as well as other connected apparatus, are group driven through shafting from one 2-h.p., 1,000-r.p.m., shunt-wound Crompton Parkinson motor.

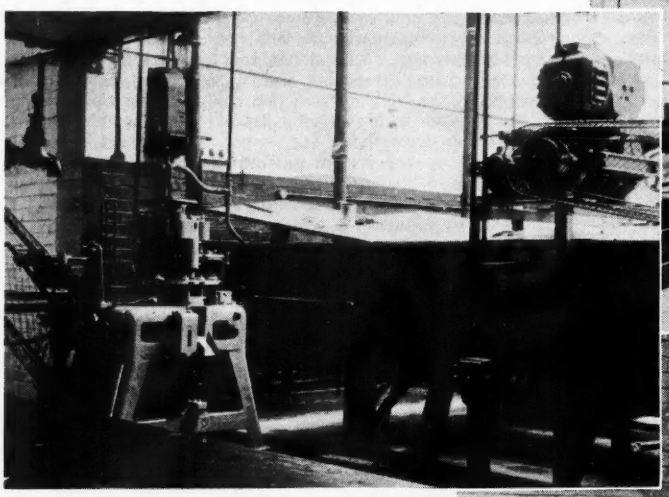
Leaving the clincher the cans spend five minutes successively in each of three exhaust tanks, passing up and down them on chain conveyors (2-h.p., 1,080-r.p.m., G.E.C. motor). The tanks, which were supplied by Mather & Platt, Ltd., are filled with water which is heated to approximately 150, 160 and 180 deg. F., respectively, the temperature of the last tank being adjusted to suit the type of fruit being dealt with.

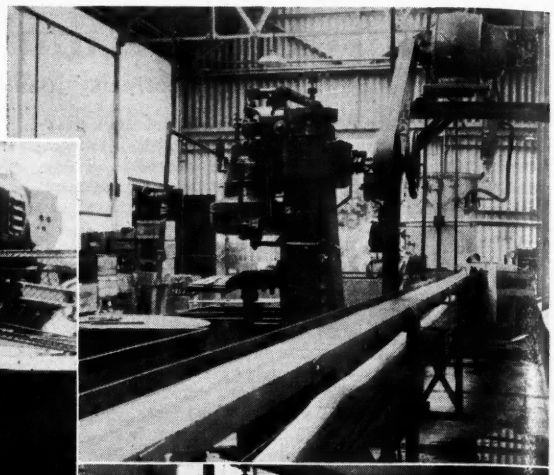
All the air inside the cans has now been exhausted and, still at a temperature of 155-160 deg. F., they go to a seamer (4-h.p., 1,420-r.p.m. motor) which closes them at the rate of about sixty a minute. According to the fruit the cans spend from seven to twenty-five minutes in a steam cooker the temperature of which is thermostatically controlled to between 204 and 210 deg. F.: the "Tycos" thermostat used is regulated by a Short & Mason compressor with a ¼-h.p. B.T.H. motor.

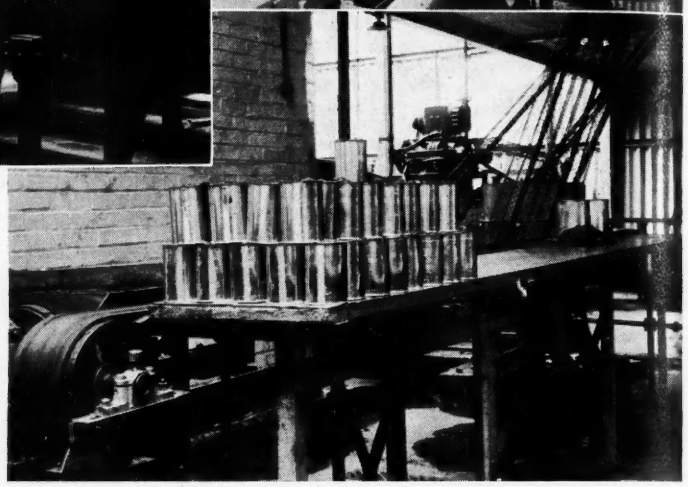
Cooling is then effected by passing the cans through sprays of cold water. Croft's variable speed gear is employed for both the exhauster and the cooker conveyors. From the cooler the cans are carried by a conveyor belt (worked off the exhausting tank motor) to yet another conveyor driven through a 25/1 reduction gear from a 1-h.p., 830-r.p.m., Higgs motor. At the far end the belt of the conveyor is inclined slightly, the cans being tipped over and falling down a shoot for packing.

For the preparation of gallon cans the production methods employed are only partly automatic, but a special seamer driven by a 2-h.p., 1,400-r.p.m., Verity motor is utilised.

In the adjoining jam factory the cooler and conveyor for the bottle washing machine are operated by Crompton Parkinson motors of respectively ¼ h.p. and 3 h.p. "Neco" motors with reduction gears giving a final speed of 100 r.p.m. drive the packing conveyor and the labelling machines.







Above: The clinching machine and corner of an exhausting tank. Top right: The despatch conveyor with an electrically driven seamer for gallon cans in the background. Bottom right: After filling, the cans pass along this conveyor to have syrup added

Except in the jam section which takes the Central Sussex Electricity Co.'s standard 400-V, a.c., the factory is operated on 110 V, d.c., from a Mather & Platt motor-generator, a Petter oil engine driving a Flather & Co. dynamo being kept as a standby.

Our thanks are due to Mr. V. Day, manager of the company, and Mr. H. J. Stround, the chief engineer, for assistance in preparing this article.

Refrigeration and the Supply Industry

By G. O. McLean, M.Eng., A.M.I.E.E.

EVERY domestic electrification campaign rightly stresses the value of developing the cooking and water heating load, and there is hardly a supply undertaking that has no specialists on its staff for each of the purposes of developing the load, demonstrating the apparatus, and servicing after installation. The class of consumer appears to have very little effect for in both Woolwich and Welwyn more than 40 per cent. of the domestic consumers have cookers, while Poplar and Wimbledon both have 28 per cent. Similarly in water heating, Gravesend and Eastbourne have each placed water heaters with 17 per cent. of their domestic consumers, while Southend and Wimbledon have each about 40 per cent.

It is essential for supply authorities to devote a great deal more attention to the question of obtaining summer loads to replace the winter lighting and heating loads. The obvious solution to the quest is refrigeration (in the limited sense of cold storage) and air cooling of buildings. The British Electrical Development Association and the refrigerator manufacturers are doing their best to place half a million domestic refrigerators this summer. Specialists have told us (vide ELECTRICAL REVIEW, April 1st and 8th, 1938) that complete electrical air-conditioning—cooling in summer and heating in winter—will succeed where heating alone cannot "get in"; and that an undertaking can obtain approximately 1,500 summer units for each 1 kW installed.

Why then is not the refrigeration load given the same treatment as cooking and water heating by the supply industry? Or why are the efforts not achieving the same results? In my opinion the answer to the second question is hidden in the first: refrigerators are not treated the same as cookers.

Development and demonstration are just beginning to be given some attention, but it is only seasonal attention and still only a very few undertakings have canvassers or a sales staff who handle nothing else but refrigerators. Servicing by experts on the undertaking's staff is almost unheard of, mainly because of the manufacturers' five-year guarantee which covers the normal hire-purchase period. All this, however, would right itself, I am sure, if the financial side were given the treatment afforded to cookers.

I am aware that hire-purchase versus simple hire is a controversial topic, but for my own part I am convinced that simple hire and even, with the poorer people, so called "uneconomical charges" and various "equated" tariffs have been the means of "getting over" electric cookers. I suggest that the same bold policy would achieve similar results for domestic refrigerators. I know that this suggestion will arouse strong counter arguments regarding capital costs, obsolescence, servicing or maintenance costs, and perhaps others which can be examined in more detail.

Gross capital costs at present appear to be approximately double that of a cooker, but just as cooker prices have considerably decreased in, say, the last ten years through quantity production, so will the cost of refrigerators when orders are in thousands instead of tens. Annual capital costs (the real criterion and not gross capital) should not then be a great deal higher, since the refrigerator's life, if based on the ratio of manufacturers' guarantees for refrigerator and cooker, should be almost twice that of a cooker. Even if we place the annual cost twice as high as a cooker, a reliable 3 cu.-ft. model could be hired at approximately one-fifth of the present five-year hire-purchase terms.

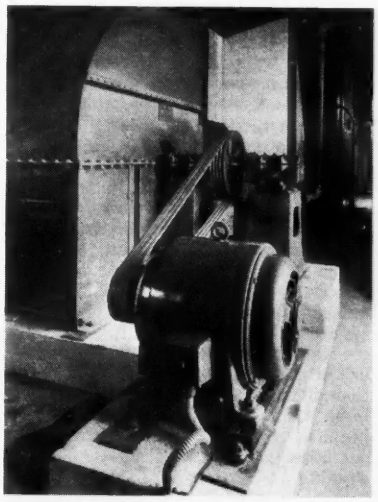
There is not so much possibility of obsolescence with refrigerators as with cookers as the fundamental cycle of compressor-condenser-evaporator, is unlikely to be improved and cabinet design alterations will not necessarily cause early obsolescence. The fact that manufacturers are prepared to guarantee their products for five years is sufficient proof that motors, compressors and coils have a very long life, and maintenance costs on valves, thermostats, and seals, are likely to be much lower than the maintenance costs on cookers.

My final argument for the proposal is the astute move of our friends, the gas industry. Their sales staff have cut the weekly payments for their small refrigerator by 23 per cent. by increasing the number of payments by 20 per cent. Instead of following them in this instance as we have so often done in the past, let us go the whole distance and by simple hire reduce our quarterly payments by 80 per cent. for the larger, superior and more efficient unit.

Art Gallery Air-conditioning

Preserving masterpieces

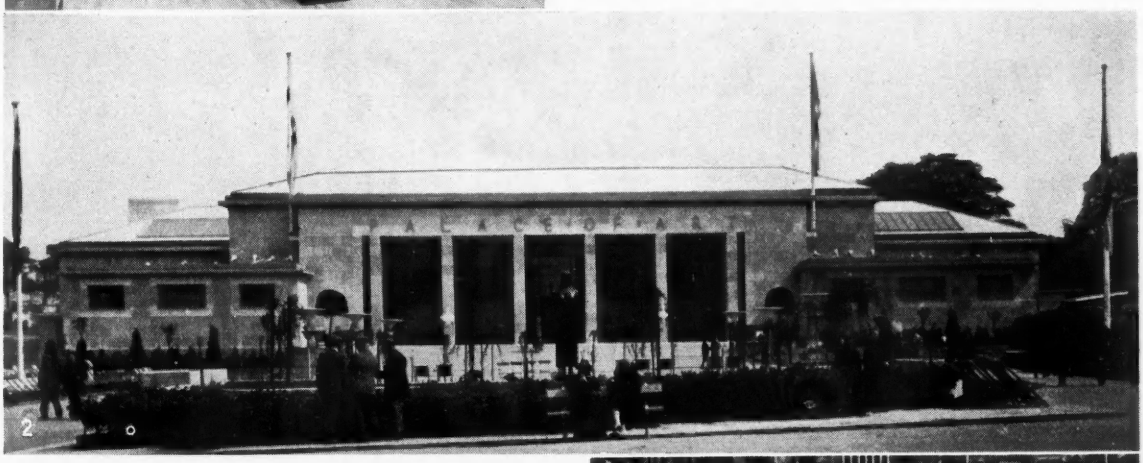
IN view of the great value—approximately £1,000,000—of the exhibits in the Palace of Art at the Empire Exhibition, which is to be taken over by the Glasgow Corporation as a permanent building when the Exhibition closes next month, it was decided to install an air-conditioning system. This system maintains a steady relative humidity from day to day, so that contraction or expansion of the canvases does not occur, and also ensures that the air contains no dirt or dust which would soil the canvases and statuary. The air which is diffused into the art galleries is guaranteed to be entirely free from dust and dirt, and 98-99 per cent. free from bacteria. It has a temperature of approximately 65 deg. F., and a relative humidity of 70 per cent. in summer, and a temperature of approximately 60 deg. F. and a relative humidity of 70 per cent. in winter. The plant is designed to deal with 24,000 cu. ft. of conditioned air per minute, 75 per cent. or less of water from the mains is also used. Atomised cold water from the spray nozzles has to find its way through three special filter beds which, with their five tons or so of filtering material also act as a cooling system. The medium for warming the air is hot water from three 780,000-B.th.u. thermostatically controlled boilers. A directly coupled motor-driven pump circulates the water by independent piping circuits to the preheater and reheater, and the motorised valves on these circuits are controlled by thermostats as well as by a "Humidostat."

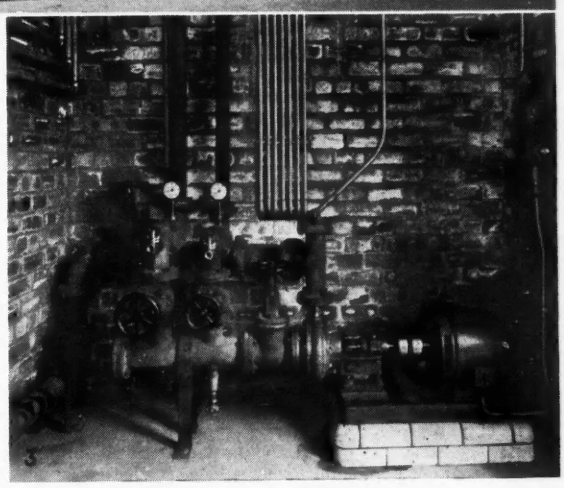


Motor-driven extract fan

Special precautions have been made to prevent sound transmission to the galleries from the plant house *via* the galvanised iron ducting. Central automatic control is provided from a large "Sindanyo" panel. Green indicator lights show at a glance what parts of the plant are operating, according to the outside weather conditions and the conditions within the art galleries, and a plant operating switch is simply switched "on" or "off" to start or stop the installation.

The complete installation was erected by Anemostat (Scotland), Ltd., in eight working weeks, to the specification of Mr. J. Campbell Murray, consulting engineer to the Exhibition authorities. The pumps referred to were supplied by Pulsometer Engineering Co., Ltd., and all the motors in the installation are products of Brook Motors, Ltd.





1. A section of the art galleries. 2. The Palace of Art. 3. Motor-driven circulating fan pump

which is reconditioned and recirculated round the building.

Galvanised iron ducts convey the air to the various points of distribution, flush with the ceiling where "Anemostats" (draughtless diffusers) distribute the conditioned air downwards and radially over the whole area. The vitiated air is extracted at the floor level and returned to the inlet side of the "Sirocco" centrifugal supply fan, which is "Texrope" driven by a 17½-h.p. protected type "Supersilent" motor which runs day and night. The temperature and relative humidity are automatically controlled electrically. There are three sets of adjustable thermostats in the galleries.

At the time that this information was collected the thermostats were set at 60 deg. F. and 62 deg. F. There is also provision for automatically increasing the temperature of the conditioned air to prevent condensation of moisture on the windows in the event of a sudden drop in the outside temperature. The water which cools the air is recirculated and filtered during most of the year by a directly motor-driven two-stage pump. During the hotter periods, however, fresh

Electricity in the Building Industry

A variety of products now on view at Olympia

THE biennial Building Trades Exhibition now being held at Olympia (September 16th to October 1st) is the twenty-first of the series. It was officially opened on Friday afternoon of last week by H.M. First Commissioner of Works, Sir Philip Sassoon. Materials, plant and tools for builders are displayed on over four hundred stands, while the Department of Scientific and Industrial Research illustrates some of the more important current investigations of interest to the building and allied trades.

The Electrical Development Association's stand heads a row of about a dozen in the main hall displaying domestic appliances:—Aidas Electric, Ltd., water heaters and immersion elements; Belling & Co., Ltd., built-in and portable fires and cookers, one of the latter with double oven doors, the inner one of glass; Berry's Electric, Ltd., fires and lighting fittings; George Bray & Co., Ltd., heating elements; E. K. Cole, Ltd., inset, portable and floor steel-cased "Thermovent" convection heaters, some with built-in thermostats and, if desired, luminous effects; Hotpoint Electric Appliance Co., Ltd., crockery washing machine, sink refuse "Disposall" machine, water heaters, small cookers and fires; Jackson Electric Stove Co., Ltd., cooking equipment for household as well as hotel and restaurant uses and a thermostatic pastry oven, round and sink-type wash boilers; and Beatty Bros., Ltd., clothes washers. The "Bar-Spot" washing machines of Barker & Turner are on view in the adjacent hall.

Two views of the E.D.A. stand at the Building Trades Exhibition

The Simplex Electric Co., Ltd., shows cookers, fires, water heaters, commercial lighting fittings and accessories, together with an under-floor duct system for wiring in modern buildings which is designed to make extra points available for future requirements without structural alterations. Premier Electric Heaters, Ltd., exhibit portable, fixed and inset fires, kettles with safety devices, flat irons, urns and glue pots, while an associated concern, Colourcraft Enamellers, Ltd., displays samples of its work. Henry Wiggin & Co., Ltd., draw attention to the merits of monel metal chambers for electric water heaters, which can be constructed by welding, so combining strength with resistance to corrosion. Samples of such tanks manufactured by Heatrae, Ltd., are on view. G. A. Harvey & Co. (London), Ltd., are makers of electric heater casings and perforated radiator covers and exhibit examples of these.

Although a few lighting fittings can be seen on one or two of the electrical stands, the only exhibitor solely concerned with illumination is the Amplilux Lighting & Illumination Co., Ltd., whose method is to increase the downward intensity by means of a prismatic glass ring, which is made to fit round the lamp, or so moulded as to form part of the glass fitting that encloses the lamp. The range of domestic and commercial fittings has been increased and, in addition, silvered 100-W shop-window reflectors and 500/1,000-W enamelled industrial reflectors are now available.

Glass that is toughened to withstand blast pressure, impact and thermal stress is shown by Pilkington Bros., Ltd., in the form of pin-type insulators for low and high voltages, well glasses for flameproof fittings and glazing for floodlighting lanterns. Another item is mirror glass made by depositing under vacuum aluminium that is electrically volatilised by the "Metrovick" process. Heat-resisting metallic paints are supplied by the Turnbridge Manufacturing & Supply Co. and also non-lead aluminium paint that reflects light for use on electric lamp standards.

Cooling and Ventilation

Domestic refrigerators made by the Pressed Steel Co., Ltd., are included in the electrical section and elsewhere cabinets are offered by Zeros (Sales), Ltd., of the motorless heat absorption type, the latest being a composite cooker-refrigerator unit. Apart from household models Kelvinator, Ltd., has combination designs incorporating kitchen cabinets and sink, also self-contained room coolers for shops and offices and floor-type air-conditioning units utilising "freon" refrigerant for cooling beer cellars, fruit storage and similar industrial applications.

Air-conditioning plant is made by Utilities (London), Ltd., for ducted systems and floor cabinets, together with "freon" compressors, propeller and centrifugal fans and unit heaters combining a motor-driven fan with a nest of steam or hot-water pipes. A similar principle is utilised by Flexaire Heaters, Ltd., and for the British Unit Heater & Radiator Co.'s "Copperad" designs, though the latter include all-electric models with totally enclosed non-luminous heating elements. Fresh air intake fans and extractors sold by Vent-Axia, Ltd., are attractively moulded in bakelite and are made suitable for fitting into window panes and partitions or flush with wall faces.

Cleaners and Tools

The "Centro-Vac" electric cleaning system of the Interoven Stove Co., Ltd., is specially designed for houses and flats, for extracting dust through entry ports in every room connected to small diameter tubing beneath the floors. In contrast are the portable suction canisters of Tellus Super Vacuum Cleaner, Ltd. "Simplex" terrazzo floor-polishing machines are supplied by W. Crockatt & Sons, Ltd., in three sizes with single and double discs. The gearing is totally enclosed in an oil bath and the design is such that the driving motor can be quickly replaced by a petrol engine, the starting of which is assisted by the provision of a "Ferodo"-lined clutch. This remains free when a wall-polishing attachment is in use, so that the floor polishing heads are then idle. A "Duplextra" floor polisher is shown on the stand of the Union Glue & Gelatine Co., Ltd.

A selection of portable electric tools shown by the British Equipment Co., Ltd., includes a disc-type hand sander for surfacing purposes and belt-type floor sanding machines which collect by suction the dust produced. Other exhibits are motor-driven hand drills and saws for cutting all sorts of builders' materials beside wood, suction cleaners and hot and cold air blowers, a portable "houser" for trenching and grooving, and the "Bosch" electric hammer which is claimed to be the only one that rotates automatically when used as a drill and is also adaptable for non-rotating chiselling. This

firm supplies transportable generating sets of from 400 W to 3 kW for operating such tools as those mentioned where public supplies of electricity are not available.

Among the several sizes of "Kango" electric hammer exhibited by Mansions Motor Co., Ltd., which are driven by universal a.c.-d.c. motors, is one for scaling boilers with a short tool for awkward situations and a lighter sort for chasing for electric conduit and cutting holes for switchboxes. Hand tools driven by long flexible shafting are displayed by the Flextol Engineering Co., Ltd. Portable motor-driven Black & Decker screwdrivers, saws, drills, sanders and hammers are exhibited by R. E. Cole, Ltd.; floor surfacing and polishing machines, electric sheet-metal shears and portable circular saws are exhibited by E. P. Barrus, Ltd.

Woodworking Machinery

Fifteen exhibitors are featuring all sorts of woodworking machines operated by motors under push-button control, such as an electro-hydraulically operated morticer and a multi-spindle automatic dovetailer that can be adjusted while in motion, by R. S. Brookman, Ltd. Among A. Cooksley's saw benches is a combination woodworker comprising a saw-bench, over and under planer, spindle moulder, horizontal tenoning apparatus, slot boring table and hollow chisel attachment, all driven by a 7.5-h.p. motor. In contrast on the stand of Danckaerts Woodworking Machinery, Ltd., is a double scribing tenoner driven by three motors and a high speed planing and moulding machine with motors built into each of the six cutter heads and the variable speed feeding gear.

Other exhibitors of joinery plant include the Dominion Machinery Co., Ltd., Kirchner & Co. (London), Ltd., who also supply electrically driven tree-felling and cross-cut chain saws; the Midland Saw & Tool Co., Ltd., Thomas Robinson & Son, Ltd., J. Sagar & Co., Ltd., Wadkin, Ltd., Thomas White & Sons, Ltd., including automatic saw sharpener, Wilson Bros. (Leeds), Ltd., whose universal machines are adaptable for performing ten or more operations, and S. Tyzack & Son, Ltd.

Interwood, Ltd., have a hot compressed-air panel shaping and veneering press requiring only one electrical connection and with all clamping mechanism controlled by a single lever. There are also a veneer joint gluer, or tapeless joiner, with all electrical gear totally enclosed; and a motor actuated machine for boring knots and such-like defects out of timber or plywood, the machine meanwhile automatically making plugs for filling the holes previously made. H. Schubert, Ltd., show electric veneer hammers, an electro-hydraulic veneer press, an electrically heated compressed-air press for panel shaping and veneering, a glue cooker and mixer that is both heated and driven electrically and motor-driven glue spreading rolls.

One of the Liner Concrete Machinery Co.'s specialities is "Altex" electric vibrators, the amplitude of which is variable, for slab-making machines which do not need other means of compression, tables for pre-cast work and a tamper for surface vibration of floor slabs, roads and footpaths. "Trillor" vibrators for similar purposes are supplied by E. P. Allam & Co., Ltd., who also make an electric elevator fitted with a tipping skip for concrete or decking platform for hoisting barrow loads of other materials.

Smith's English Clocks, Ltd., claim to cater for all styles of architectural design and Gillett & Johnston, Ltd., specialise in electric tower clock systems and bellfounding. Folding and sliding windows and doors of large sizes, which can be electrically operated, are procurable through the Educational Supply Association, Ltd.

Aerostyle, Ltd., makes spray painting plant down to 0.25 h.p., which can be motor driven and mounted on wheels for mobility. Kurt Erlach, Ltd., also offer electric paint sprayers. Turners' Asbestos Cement Co.'s products include cable conduits, ducting and pipes, while the Dover Engineering Works, Ltd., make duct covers to electrical requirements which are claimed to be water- and gas-tight and immovable under traffic. Jointers' tents and collapsible canvas shelters for cable laying are made by John Smith & Co. (London, E.), Ltd.

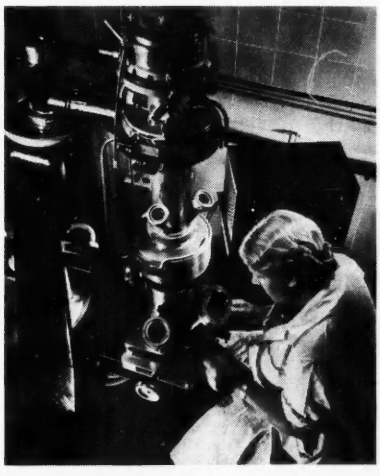
The Reliance Telephone Co., Ltd. (a G.E.C. subsidiary) offers indicator and "person finder" systems as well as all types of telephones with or without loudspeaking facilities; the latest automatic loudspeaking master station, which can be used in connection with standard auto-exchanges, requires only a twin wire no matter how many instruments are incorporated. Dictograph Telephones, Ltd., specialise in loud-speaking and intercommunication installations, staff location and fire alarm systems, and factory fatigue relief equipment for broadcasting music.

For acoustical treatment there are the cane fibre materials of Celotex, Ltd. The Rawlplug Co., Ltd., shows for the first time a new screw anchor made of metal and having a flange to prevent it being inserted too far into a hole. Hilmor, Ltd., supply bench and portable tube bending appliances for electricians.

Drawing office equipment by Norton & Gregory, Ltd., includes electric blue-print copiers, and photo-printing machines are shown by the Ozalid Co., Ltd. A 200-A welding set driven by a petrol engine and mounted on two pneumatic wheels for trailing behind a lorry is shown by T. C. Jones & Co., Ltd.

The Electron Microscope

FOLLOWING the task set by a university professor in the high-frequency laboratory of the Technical University, Berlin, for improving the cathode-ray oscillograph, there was developed, between 1927 and 1931, the original of the present electron microscope. In 1933 the first instrument was completed by B. von Bories and E. Ruska, and it is still used in the university institute. It gives a magnification of 12,000.



An electron microscope

It was not until 1936-37 that it was found possible to produce the instrument on a more or less commercial basis. It is largely due to the support of the medical authorities at the Berlin Charité and their work with the new instrument that it has been possible to produce an electron microscope giving magnifications of up to 100,000 at the moment; this is not considered the limit.

Siemens of Berlin recently demonstrated the instrument to the Press for the first time. The voltage required for the cathode-ray "gun," as it might be called, is very high (80,000 V) so as to produce maximum velocity of the electrons to prevent them from heating or otherwise influencing the object to be viewed. This object is contained in a small cylindrical receptacle and the whole is placed in the high vacuum of the microscope. Ingenious levers have been provided which allow the operator to move the object to and fro at will and to bring into focus that part of the image which he wishes to inspect.

The actual magnification proceeds in two stages. By using specially constructed coils the "focal" length of the electric lens is extremely short, the object being very close to the coils. This gives considerable magnification which is then stepped up again to the screen or photographic plate at the bottom of the instrument. In a similar manner to X-rays the electron microscope does not supply a colour image but a contour image. The price of the new microscope, which promises to revolutionise scientific research in making the hitherto invisible visible, is roughly £5,000.

South African Representation in London

WE learn from *South Africa* that the Electricity Supply Commission of South Africa, the South African Iron and Steel Industrial Corporation, the Steel Sales Co. of Africa (Proprietary), Ltd., and the African Metals Corporation, have associated themselves in establishing a London office. Mr. G. A. Jenkin, who recently retired from the Union Public Service, will represent these bodies in London, and hopes in the course of the next few weeks to open offices in Adelphi.

I.E.E. Students' Visit

A visit for the London Students' Section of the I.E.E. has been arranged for the afternoon of Saturday, October 8th, to the Park Street Brewery of Barclay, Perkins & Co., Ltd., and applications for tickets should be sent immediately to the Secretary of the Institution at Savoy Place, W.C.2.

Electrical Conductors.

By G. A. Percival, A.Inst.P.

A general review of present knowledge

WITHIN the category of electrical conductors, metals, non-metals and gases may be grouped according to their relative properties. Copper is usually thought of as the prime conductor, and the accumulating research in that direction is indicative of the demand for wider industrial knowledge, in spite of the great mass of data already existing. Copper with silicon, manganese, aluminium and nickel form binary and tertiary alloys which increase in thermal conductivity with temperature, even though copper decreases. An increase in the proportion of the added metal in the α solid solution range, corresponds with a decrease in conductivity; the Lorenz ratio (of thermal to electrical conductivity) increasing at first rapidly and then more slowly.*

Determinations made at 20 and 200 deg. C., show that with copper alloys the ratio of thermal to electrical conductivity varies, although the results at both these temperatures lie on a single curve when thermal conductivity is plotted against the product of electrical conductivity and absolute temperature (1). A straight line curve is intersected at the thermal conductivity axis with a definite value, and apparently the results are closer to the curve than in the case of a constant Lorenz ratio.

Attention is drawn in this article to the more general aspects of a complex subject which has an important bearing on a large number of the industrial problems of to-day

Copper and aluminium of commercial quality vary in mechanical and electrical constants according to the treatment during manufacture and quite independently of the composition. In cables the electrical conductivity varies with the degree of drawing reduction, the physical endurance limit increasing as a linear function; but at reduction stages of 41, 82, 93, and 98 per cent. copper shows a definite inflexion of the curve, which applies to aluminium at a reduction of 62, 88, 96 and 98 per cent.

These inflexions in the curves suggest a slower increase in the endurance limit of copper than of aluminium, with a higher degree of reduction during the drawing process. Fatigue figures of both copper and aluminium increase with the degree of mechanical working up to 85 per cent., after which the increase is more rapid. But although the electrical conductivity of aluminium is not affected to any degree by the decrease in area reduction, that of copper decreases with mechanical working, down to 80 per cent., after which it increases up to 90 per cent. reduction. Obviously, therefore, a final annealing to remove mechanical strain and unstable factors is important for regularity.

Ageing of metal conductors, whether in the so-called *pure* state or alloyed with other metals, may or may not affect the ultimate characteristics. Copper-aluminium alloys containing magnesium, annealed at 100 and 205 deg. C. and measured at 0 and −192 deg. C., give practically constant Lorenz numbers, the ageing curve for resistance following a hyperbolic function. Eucker and Warrentrup (2) attribute the difference between their results and those of other workers to the effects of oxidisation, probably caused by the occlusion of oxygen during the casting of the alloys.

Treatment of Tungsten

In the case of tungsten filament, additive material in the initial batch appreciably affects the nature of the final product, causing a sagging or non-sagging wire in the lamp. It is not so well known, however, that getters introduced into the exhaust, or gas-supply system (such as phenylhydrazine), further affect the life performance of a lamp. The conditions under which such getters are introduced also affect the ultimate product, as also does the heat treatment, or time voltage curve, applied to the finished lamp.

All these factors contribute to the production of a quality product in terms of life and lumen maintenance. Composition and heat treatment of the tungsten slug during manufacture is of as much importance as the treatment during fabrication of the lamp; the two considerations are essentially complementary, yet both depend on the control of crystal structure. The fact that a better lamp can now be sold for sixpence than could be obtained for as many shillings little more than twenty years ago is indicative of the progress made.

In the case of silver, impurities—sometimes as definite additives—profoundly affect the characteristics. Silver with 0.04 per cent. of copper increases from 80 to 175 deg. C. in recrystallising temperature. A further 0.2 per cent. of copper reduces the temperature point by 25 deg. C. Silver of the highest purity, which crystallises at room temperature, will not recrystallise after several weeks if copper is present in certain proportions.

Aluminium with 12 per cent. magnesium and small quantities of manganese varies considerably in electrical conductivity, depending on the method of treatment. By slow cooling of the alloy, the solubility of the magnesium in the aluminium decreases rapidly from 15.3 per cent. at 415 deg. C., to 2.8 per cent. at room temperature. With more than 2.8 per cent. the alloy may have a homogenous or heterogeneous structure according to the rate of cooling. Quenched, the specific resistance increases from 3.27×10^{-6} ohms for 0 per cent., to 9.65×10^{-6} ohms with 11.8 per cent. magnesium. With increasing magnesium content, the temperature coefficient decreases, while the cold working of the metal does not affect the electrical conductivity in any way.

Regularity in the method of production affects the resultant compound or alloy, as distinct from mere composition. In the case of nickel-chrome alloys there is a considerable difference between the ultimate product, depending on the method of manufacture, largely in the process of melting. Crucible melting is preferable to the use of high-frequency furnaces unless special precautions are observed. The slag must be removed and occluded gases eliminated as far as possible before pouring. After casting, the bars should be rolled and then ground before forging and subsequent rolling, all as a preliminary to final cold drawing (3). The first forging is carried out at 1,300 deg. C. and the second rolling at 1,150 deg. C.

While, strictly speaking, nickel-chrome alloys cannot be considered as conductors, such alloys are closely related as the core of the leading-in wires of filament lamps. There were originally made of platinum, but with the increasing use of electric light substitutes had to be found and platinum sheathed wire or base-metal alloys like Tital made their appearance, followed by the cheaper and more reliable copper-clad or Dumet wire.

This wire has a core of alloy steel with a layer of silver, upon which is swaged pure copper. The composite bar is swaged to ensure close contact of the components, followed by heat treatment to make a weld between the copper and the core. As the billet has to be subsequently drawn down to wire, small air pockets or particles of impurity would cause defects throughout a length of wire, with possible loss of thousands of lamps due to defective seals in the glass pinch. Further, as the co-efficient of expansion in relation to that of the glass is vital, the percentage of copper must be calculated and determined with absolute accuracy.

With such conductors, the composition of the core and the method of treatment are of equal importance in producing high-quality material, but there are other considerations in the case of platinum-substitute wires, quite apart from the conductivity and the property of sealing with glass.

The cooling effect on an incandescent filament—especially in the case of auto lamps—may affect the efficiency and life very materially, so that good electrical conduction with minimum physical mass must be associated with mechanical strength. In the majority of lamps, copper-clad wire is used only in short lengths, one end welded to nickel and the other to copper, to make a composite three-piece wire. While there are no fundamental difficulties in this instance, welds made in certain classes of instrument can give rise to corrosion owing to electrolytic effects or even to diffusion between one metal and another.

Caplan (4) describes an instance where a gold wire diffused between a nickel-chromium connection, an alloy of lower melting point being formed which rapidly oxidised. The gold link disintegrated and became a powdery residue.

Where a film of one metal has to be made the welding medium between one metal and another—as with copper-clad—certain characteristics determine their value as conductors, particularly if there is no heat treatment or stabilising process. This applies in the case of mirrors made by depositing metal on a glass mould. The glass surface is first silvered by the usual methods and built up with electro-deposited silver before receiving a backing of copper. The metal mirror is then stripped from the mould. In given electrolytes, a silver deposit may be in two phases, owing to the initial flash and the subsequent building up; but the electrical conductivity

* Weidermann and Franz determined the ratio of thermal to electrical conductivity in a number of metals and deduced a universal constant which was independent of the nature of the metal. Later (in 1872) Lorenz—not to be confused with Lorentz—suggested that the ratio divided by the absolute temperature also was a constant.

Correspondence

Every letter must be accompanied by the writer's name and address preferably, but not necessarily, for publication. The Editors cannot accept responsibility for correspondents' opinions

Avoiding Increased Charges

IN view of the rising prices of food, increasing local rates and the advance in income tax, it is highly desirable that tariffs for electricity supply to the public should not be increased. It is lamentable to learn that the London and Home Counties J.E.A. has decided to impose an increase of 10 per cent. in its distribution areas as there appears to be another method of meeting the increased cost of fuel and other commodities required in the generation and distribution of electricity.

This consists in offering easily understood inducements to consumers not to increase their maximum demand for electricity but to substantially increase their consumption within the limits of their existing maximum load. This can be achieved by offering a sliding scale of flat rate charges which shall begin at a substantial charge per unit to consumers with a heavy maximum load relative to the kWh consumed, which charge will gradually decrease as the ratio between the maximum load and the units consumed increases, until an ultimate flat rate as low as ½d. or even ¼d. per kWh may be reached.

Such a tariff will be appreciated and adopted by consumers, it will be profitable to the supply undertakers, it will increase the hours during which existing generating plants are economically loaded, while, on the part of the manufacturers and wiring contractors, it will stimulate the production and use of thermal storage methods of cooking, water and space heating, and in these ways the average cost of generation and distribution will be reduced and no increase will be made in tariffs.

There is no tariff in vogue which in any degree encourages the introduction and use of heat storage for the homes of the people; the vaunted "domestic" tariffs based either on the rateable value or on the number of rooms offer no incentive in this direction. For example, a domestic consumer on the r.v. system consuming 12,000 kWh a year may have a maximum demand of 8 kW, while his neighbour may consume the same amount of energy with a maximum demand of less than half.

Assuming the actual fixed cost to the local supply authority at £6 per kW, including local administration, with a diversity of 2 to 1, the cost of the supply, excluding running charges, in the first case will be £24, while in the second case it will be less than £12, nevertheless, they will both have equal bills to pay. The inequity is obvious. GEO. WILKINSON.

Harrogate, *September 16th.*

Employers and the I.E.E.

Some of your correspondents seem rather to have lost sight of the point of your original leader on the question of the "Status of a Graduate." The correspondence has tended to become a discussion on I.E.E. qualifications generally, whereas the original question raised was whether employers were sufficiently appreciative of the fact that the technical qualifications of a Graduate of the I.E.E., as established by examination, were identical with those of an Associate Member, and that the only distinction between the two was that Associate Membership gave proof of practical experience with some responsibility.

I do not think that there was any invitation to your readers to criticise I.E.E. status generally, nor can there be any justification for proposals for a rival body. REALIST.

September 16th.

From the varied opinions given by your correspondents on the above subject one is led to believe that only those with large financial resources, in addition to the necessary time, can ever hope to attain the desired end. This excludes a vast number of highly efficient members of the electrical industry, whose personal income and time are limited, but who are at least as skilled in practical work as are those with high technical qualifications, as it is always found that the best engineers are those who have been right through the work and studied it in all its aspects.

To say that there are only two types of electrical engineers, the I.E.E. member and the jerry wireman, is an insult to the electrical engineering community, as there are just as many efficient engineers not members as there are in the membership, from which they are only barred by the reasons outlined. R. W. RAPSON,

Chief Sales and Service Engineer,
Workman, Reed & Co., Ltd.

Bristol, *September 19th.*

It was not my intention to take part in the discussion in your columns on the above subject, although I feel that the points raised often exercise the minds of electrical engineers. I am, however, interested in the references to practical and technical engineers, and the difficulty in the way of such men sitting for an examination, mostly of a theoretical character, at the age of 35 and upwards needs no emphasis. In fact, this position was considered some years ago by my Association when a proposal to hold a practical examination and to issue a practical diploma was considered and the question was postponed on account of the expense which such a scheme would involve. A further argument against the proposal was that membership of the A.S.E.E. was in itself evidence of the practical and technical experience and training of the engineer, and it is a fact that membership of the Association is recognised as a practical and technical qualification.

It may be that what your correspondent "W. E. L." refers to as "sound, dyed in the wool" electrical engineers are the class to which I have referred, and if this is so, there is already an organisation in existence which caters for them provided their qualifications comply with the Association's requirements. Those who have knowledge of the work of the A.S.E.E. will have appreciated the efforts it has made to secure that recognition for the practical and technical engineer which his achievement and work well merit. One of our greatest difficulties is to convince the non-technical employer of the important part played by the supervising electrical engineer in industry.

"W. E. L.," I feel confident, does not express the view of those employed in electrical work when he suggests the formation of a further organisation. Those who understand the position know that the interests of all concerned are served by one or other of the organisations existing to-day, and the practical and technical electrical engineer will find it is necessary to sacrifice time and money to achieve an alteration to that tag—"the engineer is the man who works and says now't."

A further difficulty is the practical and technical supervising electrical engineer who does not realise his own important part and does not appreciate the necessity of joining his fellows in their efforts to safeguard the profession of which he is a member. A. BRAMMER,

General Secretary,
Association of Supervising Electrical Engineers.

London, W.C.2, *September 20th.*

I heartily endorse the views of "A.M.I.E.E." in your issue of the 16th instant, especially in so far as he emphasises the need for prohibiting all who are not qualified, from calling themselves "electrical engineers." Most professions have recognised that the designation is the hall mark by which the profession is known to the public, and that if this is used indiscriminately or sullied in any way the reputation of the profession as a whole is bound to suffer.

Electrical Conductors

(Continued from preceding page)

of one phase may be a hundred times as great as that of the other.

Unfortunately, in many instances substances are electrical conductors where they are least desirable. Thus water is always ready to become aggresive at the most unexpected moments. The conductivity of water depends largely upon the source of origin. Distilled in platinum, it has a higher conductivity than if distilled in a glass vessel (5). Similarly, insulating cements depend as much on the physical condition of the components as on the attributed electrical properties. Mica and glass are accepted as insulators of the first order, but mixed in powder form they increase the affinity for water of the medium with which they are used (6) so that, particularly in humid surroundings, breakdown may occur of what would have been considered a safe insulating material.

With transformer oil, too, there is a tendency for water to dissolve or emulsify if active organic matter collects on the surface. With low concentration, the surface active acid causes emulsification, but with higher concentration the water goes into molecular solution.

References:—

(1) Smith and Palmer. Am. Inst. Min. & Met. Eng. No. 648.
(2) Eucker and Warrentrup. Z. Elek. 41. 1935.
(3) Gintzburg and Goldberg. Inst. Met. (U.S.S.R.) No. 15.
(4) Caplan. J. Inst. Metals. 1935.
(5) Kling and Lasslear. Compt. rend. 201.
(6) Melton, Brownell and Easter. J. Am. Cer. Soc. No. 18.

The vagueness which exists in the minds of the public, and often in that of the prospective employer, as to who is, or who is not, a qualified engineer, would be completely removed by legislation which defined precisely that only a certain group, having passed prescribed tests of knowledge, competency and character, are entitled to use the designation "engineer." If registration in medicine, law and dentistry has been accepted for many years, why not registration of the engineering profession whose responsibility to the public cannot be considered of less importance than that of the legally registered professions? Engineers require to be registered in several countries. My Association continues to regard the registration of engineers in Ireland as its primary object, and hopes that a similar object will engage the attention of the engineers in Great Britain.

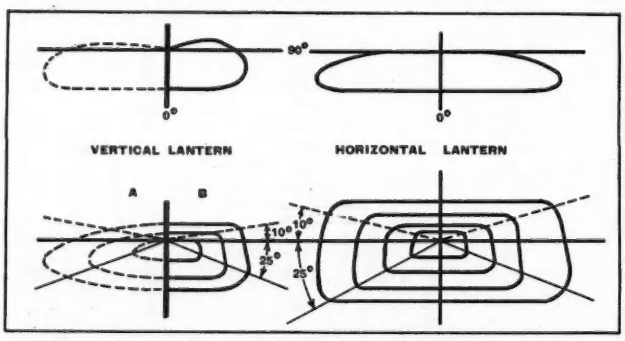
J. G. CHARLETON,
Secretary,
Dublin, *September 20th*. The Engineers' Association.

Lantern Characteristics

The "Review" is to be congratulated on producing in the issue of September 2nd a most interesting and comprehensive summary of recent developments in all fields of lighting. Such summaries, formulated by authorities familiar with the particular aspects under review, form a valuable source of reference to all lighting engineers, particularly so as the rapid advances which are continually being made render it almost impossible to obtain text books covering completely lighting practice as it is known to-day.

As an advocate of "controlled cut-off" distribution for street lighting lanterns, however, I feel that both Mr. Lennox and Mr. Bright have overlooked one important point when dealing with horizontal lanterns for discharge lamps. It is true, as Mr. Lennox points out, that lanterns using lamps burning in a vertical position can, and do, produce satisfactory intensities at the angles within a few degrees of the horizontal that are necessary to produce high and even road brightness, but this alone is not the sole criterion of the lantern performance required to give a completely satisfactory installation. It is equally important that these high-angle intensities should be extended over the whole width of the road in the form of a widely maintained beam spread, covering not only straight roadways but also bends, footpaths and such vertical surfaces as may be useful to assist in the formation of a brightness background.

In addition to this, the question of glare must be considered. With a controlled cut-off the exact shape of the vertical polar curve between 70 and 90 deg. from the downward vertical is of the utmost importance, being determined by a compromise between the two most prominent effects of a lighting scheme—road brightness and glare. In particular, this requires very careful grading of the output from a high candlepower at 85 deg. to a very low value at the horizontal with no light above this angle.



Iso-foot candle diagrams for vertical and horizontal lanterns

Consideration of the principles of light redirection shows that the accuracy of control required to fulfil the above requirements is very difficult, in fact impossible to achieve with a vertical line source. No matter whether reflectors or refractors be used for the control, if the candle-power is given a high intensity between 70 and 85 deg. it must unavoidably have a high value at the horizontal also.

The sketches herewith show typical curves obtained from a number of lanterns of the vertical burning type compared with those obtainable with a horizontal lantern. It will be noted that, whilst peak candle-powers near the horizontal (shown dotted in curve A) for the former type are of the same order as those of the latter, the beam spread is appreciably narrower, and when this spread is increased (shown full at B) the peak candle-powers drop. Added to this there is always the high output at the horizontal, resulting in wastage and glare.

In conclusion, I should like to refer to the articles by Mr. Maxted, in your issues of May 13th and 20th of this year, in which the advantages of horizontal operation, particularly in conjunction with magnetic control, are outlined. While perhaps not all horizontal lanterns effectively employ all these features, their inherent natural advantages have greatly increased their popularity tremendously over the last year. Whereas in July of last year there was only one lantern on the market using a horizontal mercury-discharge source, practically every manufacturer was showing at least one such lantern at the exhibition held in conjunction with the recent annual conference of the Association of Public Lighting Engineers.

F. K. GARRY.
London, W.C.2, *September 13th*.

High-voltage Paper Insulators

Referring to the letter from "Antipodes" in your issue of August 26th, owing to the care taken in the manufacture of high-voltage paper insulators to ensure the highest possible quality, very little trouble from insulation failure is experienced. Nevertheless, if moisture penetrates the protective varnished film and enters the body of the material deterioration may result. Bakelised paper insulation can be made to be unaffected even by immersion in water but this type of material has comparatively high dielectric losses and is reserved for installations lower than 11 kV. Generally speaking, high-voltage insulators are made from material which is more or less hygroscopic and the prime object of precautions taken in the maintenance, storage and handling of bushings should be to prevent access of moisture.

When handling high-voltage paper insulators care should be taken to prevent damage of the exterior varnish finish. Scratches and chips caused by clumsy handling or by contact with edged tools may be detrimental to an insulator working in air. When replacing insulators in switchgear or transformers, it is advisable to surround the exposed varnished paper surface with a protective skirt which should remain in position until all the work has been completed. A cardboard tube will serve admirably.

Insulators can deteriorate in storage; moisture is again the prime cause, but the following precautions may be taken:—The insulators can be stored in a warm, dry room or in special cupboards or cases which contain a drying agent such as calcium chloride. Large insulators may be covered with a protective wrapping; for example, the exposed varnished paper can be wrapped with thin cotton tape, which must cover the whole surface, and then coated with melted paraffin wax; a good protective covering will nullify the effect of even humid storage conditions. Insulators after storage and immediately before installation may be dried out in an oven for some hours at a temperature not exceeding 100 deg. C. but care must be taken to prevent draughts of cold air blowing on hot insulators.

Once an insulator is in use, little deterioration is to be feared so long as the insulators are electrified. Spare switches standing in an unheated sub-station may be subjected to condensation, water actually being deposited on the insulator surface. On metal-clad switchgear, the insulators most likely to be affected are those of the plug and orifice type. Money spent on keeping the sub-station warm and dry is more than repaid by increased life of the insulation.

In addition to deterioration due to absorption of moisture, ultimate breakdown can result from the presence of internal ionisation whilst the insulators are in service. Insulator manufacturers ensure that their products are free from ionisation at working voltage in the condition in which they leave the factory. If an insulator receives a severe mechanical shock (*e.g.*, through being dropped to the floor from a height), the voltage at which internal ionisation commences may be reduced and the insulator rendered less able to withstand service conditions.

W. J. BROWN,
Chief Engineer,
Hebburn-on-Tyne, *September 13th*. Bushing Co., Ltd.

A.S.E.E. Informal Meetings

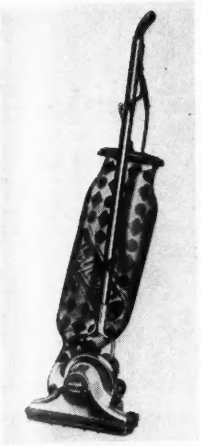
THE informal meetings of the 1938-39 session of the Association of Supervising Electrical Engineers will commence on November 1st. These meetings, which are in addition to the monthly lecture meetings, will be held at Aldwych House London, W.C.2. The programme for the session is as follows:—November 1st: "The Administrative and Technical Worker and the Trade Union Movement," by Mr. G. W. Thompson. November 30th: "Public Control of Public Utilities," by Mr. J. W. Simpson. January 5th: "Factory Act, 1937," by Mr. S. R. Bennett. January 31st: "The Travel Bureau and the Employee," by Mr. A. Creech Jones. March 1st "Personnel in Industry," by Mr. A. P. Young. March 30th: "The Production of an Association Journal," by Mr. A. Brammer. April 25th: "The Apprenticeship System," by Mr. R. F. Appleyard.

New Electrical Products

A review of equipment recently marketed

Improved "Hotpoint" Vacuum Cleaner

A number of improvements in design have recently been made in the "Junior" model vacuum cleaner made by the HOTPOINT ELECTRIC APPLIANCE CO., LTD., 9-13, Kean Street, Drury Lane, London, W.C.2.



The latest "Hotpoint Junior" cleaner

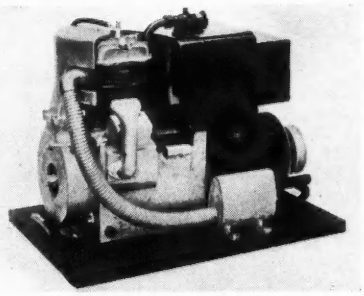
The switch-plate now embodies a support for the flexible cable which is carried away from the handle at a more suitable angle, while the service cable and the cable which is led down the handle are now connected to a terminal plate to facilitate the fitting of new leads when necessary.

The diameter of the brush spindle has been increased and the arrangement of the bristle tufts altered to ensure greater efficiency and eliminate any tendency for cottons, hair, &c., to wind round the brush.

The shoulders over the brush bearing housings have been reversed to prevent dirt finding its way into the bearings. The outside adjustment of the brush has been replaced by a neat form of internal adjustment giving a range of four positions instead of three. The brush holder springs have been simplified and are now so designed as to make the removal of the floor brush an easy operation. The suction cap has been improved in appearance and strengthened. Another refinement is the fitting of rubber protectors to the bag clamp.

Improved Generating Set

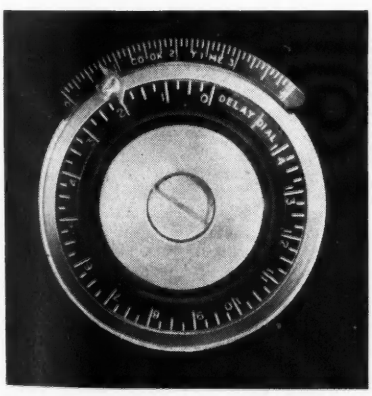
BRADBY'S ENGINEERING WORKS, Palace Gate, Kensington, London, W.8, announce many improvements in the design of the "Pygmylyte" generating set which is now fitted with an outside fan and cowl to cool the cylinder by forced draught, and a breather for the valves. Two carrying handles have also been added, and an exhaust valve lifter has been incorporated to facilitate starting.



The improved "Pygmylyte" generating set

A Time Switch for Cookers

The HORSTMANN GEAR CO., LTD., of Albion Works, Bath, has been experimenting for some time with a cooker control unit and is now commencing production.



The Horstmann time switch for cookers

The unit has two dials which control the actual period of cooking and the time at which cooking commences. This latter control is by means of a delay dial, and any delay up to fourteen hours can be obtained while the actual period of cooking can be set for any period up to four hours.

Drive is by a self-starting synchronous motor and arrangements are being made to supply this equipment for flush fixing in new cookers and a separate model will also be obtainable for fitting to existing cookers. By ignoring the delay setting the device can be used as an ordinary "on" and "off" switch.

Insulated Clip-on Ammeter

A number of improvements have been made in the design of the "Clip-on" ammeter of FERRANTI, LTD., Hollinwood.

Additional insulation has been provided covering all the metal parts and the frame and handle have been strengthened, so that the instrument can be used on bare conductors rated at up to 600 V. With a moving-iron type ammeter accuracy is within 2 per cent. of full scale on all ranges up to and including 500 A, while above 500 A it is 3 per cent. With a rectifier type ammeter accuracy is within 3 per cent. of full scale on all ranges.

The improved Ferranti "Clip-on" ammeter

The standard model is suitable for conductors up to $2\frac{3}{16}$ in. diameter, but special models are available for conductors up to $3\frac{5}{8}$ in. by $2\frac{3}{8}$ in. and $4\frac{1}{2}$ in. by $3\frac{1}{2}$ in.

An Adhesive Thread

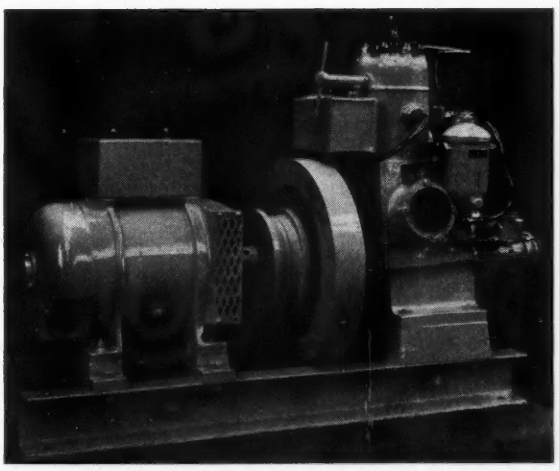
Adhesive tape has been available for many years, but the V.G. MANUFACTURING CO., LTD., Gorst Road, Park Road, London, N.W.10, has lately introduced adhesive thread which is sold in reels of 100 yards. It is eminently suitable for binding and tying off the frayed ends of flexible wires and cables.

A Batten Sign Lampholder

THE COLLIER ELECTRIC CO., LTD., Colmac Works, Edwin Road, Twickenham, has lately introduced a black moulded all-insulated lampholder of the batten type specially suitable for signs.

A Small Heavy-oil Engine

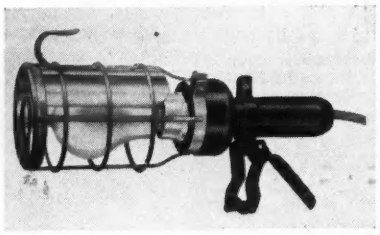
A Diesel engine developing 3 b.h.p. at 1,500 r.p.m., which is in production by STUART TURNER, LTD., has a cylinder capacity of 304 cu. cm. with $2\frac{3}{4}$ in. bore by 4 in. stroke, and is claimed to be the smallest commercial engine of the kind made. It is of the two-stroke two-port type with crankcase compression. The crankcase is in three sections, the main bearings being outside the compression chamber. Lubrication is by pump for the big end, by splash for the small end bearings and cylinder walls, and by oil bath for the main bearings and governor. A Bosch fuel pump and atomiser are employed, the governor operating directly on the fuel pump. The connecting rod has needle roller bearings both for the big end and the gudgeon pin, while ball bearings are used for the four main journals and governor. The composite piston has a heat-resisting steel head which forms part of the combustion chamber. Four compression rings and a scraper ring are fitted above the gudgeon pin. In the cylinder head is a relief valve. The engine is designed primarily for direct coupling to a 1½-kW generator on the same cast-iron bed plate. For marine service it is fitted with a gunmetal plunger circulating water pump.



The Stuart-Turner 3-b.h.p. Diesel engine

An Improved Hand-lamp

An improved type of inspection hand-lamp for garages and workshops has been introduced by the WENHAM LIGHTING CPN., LTD., 3 and 4, Roger Street, Gray's Inn Road, London, W.C.1. It complies with the Home Office requirements and has a black ebonised wooden handle, a porcelain b.c. holder with a deep skirt and special cord grip and a reflector which clips into the rim and rotates. A suspension hook is provided and the guard is cadmium plated, all joints being spot welded. The heavy metal clip has rubber jaws and a swivel joint. The fitting will take lamps rated at up to 100 W.

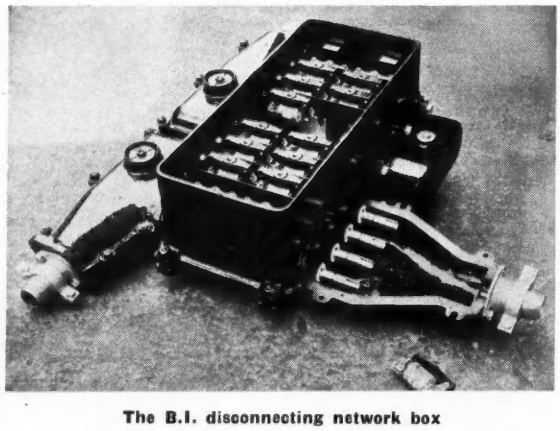


The Wenham inspection hand-lamp

Disconnecting Network Boxes

For circuits of up to 660-V BRITISH INSULATED CABLES, LTD., Prescot, has recently commenced manufacturing a new type of disconnecting network box, of which we have already published preliminary details.

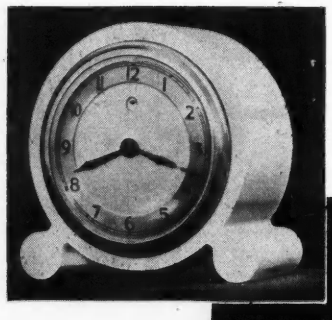
The use of a detachable pocket-type network box considerably facilitates jointing. A central body of standard design contains bus-bars and links on fuses and is provided with the usual turret and lid. The terminals for the cables project through bushes at the side of the body and over these are bolted the detachable pockets. The main body of the box can be filled in with compound to the required height before being sent out so that on site it is only necessary to connect the cables to the terminals, fix the pockets in position, and fill them with compound. Straight or right-angled pockets are available, spare outlets being closed with a cast-iron cover. In the case of the standard disconnecting network boxes, the base contains the whole of the fittings so that all jointing can be completed before the turret is placed in position.

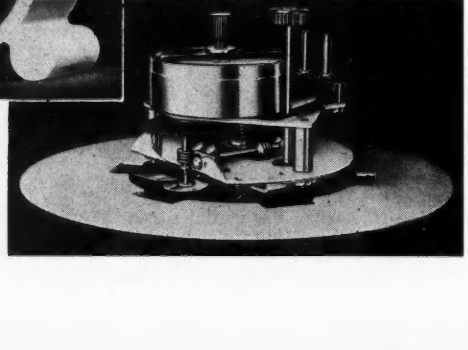


The B.I. disconnecting network box

The diving bell lid is designed to withstand a maximum head of 6 ft. of water and boxes can be supplied with cast-iron pits and pavement covers. All current-carrying parts are made from copper strips and the cable fittings and bus-bars are mounted on substantial insulated steel rods. The boxes can be supplied fitted with either links or high-rupturing capacity fuses and carriers for both are tightened by a wedge type clamping device operated by an insulated key. Links with insulated handles are provided if the fifth core and the phases are separated by means of a frame of insulating material, a compartment being provided for each set of fuses or links.

Special arrangements are made to ensure correct levelling of the box.

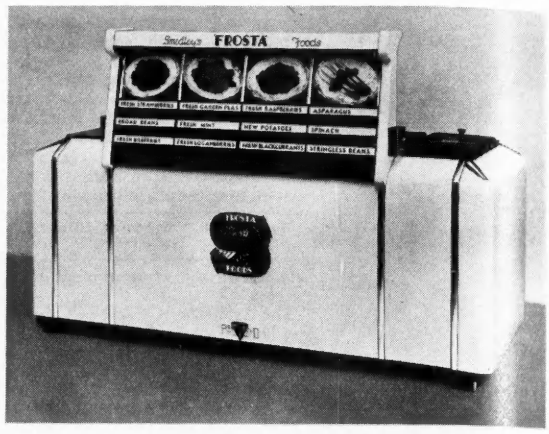




A "Temco" clock with Catalin case and (right) a view of the "Temco" movement

A Refrigerated Fruit Storage Cabinet

To enable fruiterers and greengrocers to provide efficient all-the-year round storage for fruit and vegetables which have a limited season the PRESSED STEEL CO., LTD., Cowley, Oxford, has commenced manufacturing a special type refrigerated food cabinet.



The "Prestcold" frosted food cabinet

The fruits and vegetables are frozen shortly after picking and supplied to the retailer in wax containers which are kept in the cabinet, the temperature of which is maintained at 5 deg. F.

An increased storage capacity is obtained by the use of a double-deck sliding bin, and movable bins on ball bearing rollers give access to the bottom half of the cabinet. The storage compartment has small radius corners to facilitate cleaning without sacrificing space.

The cabinet is carried on an undercut plinth form of base to provide additional toe room, and can be fitted with an illuminated sign with holders for display cards. A twin-cylinder ⅓-h.p. compressor unit is housed in a compartment at the end of the cabinet and by removing a loose top cover it can easily be inspected. "Duplex" temperature control regulates the internal temperature and a flashing indicator gives warning of refrigeration failure.

The overall dimensions are 78 in. long by 32⅝ in. high by 31¼ in. wide, the height being increased to 52½ in. if the sign board is included. The capacity is 10.5 cu. ft.

Plugs and Sockets for Standard Boxes

A new range of plugs and sockets for B.S.S. circular boxes, in three-pin two- or five-ampere sizes, is now being manufactured by M.K. ELECTRIC, LTD., Wakefield Street, Edmonton, London, N.18.

The new M.K. socket

The sockets are designed for use with small circular conduit-boxes, and are made in accordance with B.S.S. 546 with either flush or overlapping flanges of heavy gauge brass, having two countersunk fixing holes on 2-in. centres.

The usual M.K. features such as patent spring grip sockets, vitreous porcelain base, finger shield and flex grip plug are incorporated and both flush and overlapping type sockets are obtainable.

Electric Clocks

The already large range of 109 "Temco" a.c. synchronous electric clocks made by Telephone Manufacturing Co., Ltd., and marketed by T. M. C. HARWELL (SALES), LTD., 233, Shaftesbury Avenue, London, W.C.2, has now been increased by thirty-nine new models. These models are divided into twenty wood mantel types, eight metal and glass, two coloured "Catalin" and two new wood wall models. No. 4002 is an 4003, 4004 and 4005 are in chrome and coloured "Briolite" finish.

There are seven cheap and attractive models in Jacobean oak finish for mantelshelf use. No. 774 (illus.) has a case made of "Catalin"—a lustrous material available in white onyx finish on a black base, lacquer green on black base or all tortoiseshell. Silvered hands and fretted zone are mounted on a black dial plate. As in several other new "Temco" models, the usual bezel has been dispensed with and the convex glass is secured by four chromium screws. This gives an appearance of lightness without sacrifice of efficiency.

A "Temco" clock with a white onyx Catalin case is shown in the accompanying illustration and also a view of the "Temco" movement.

British Overseas Electrical Trade

Exports of most types of electrical equipment last month were well above the values for August, 1937.

THERE was not the usual sharp falling off in electrical exports in August which is characteristic of the popular holiday month. This was especially surprising as exports as a whole touched the lowest level for nearly two years.

TABLE I.—EXPORTS AND IMPORTS DURING AUGUST

	Exports. Aug., 1938.	Exports. Inc. or dec. compared with Aug., 1937.	Imports. Aug., 1938.	Imports. Inc. or dec. compared with Aug., 1937.
Submarine telegraph and telephone cables	£14,944	− £786	*	—
Telegraph and telephone wires and cables (not submarine)	68,994	+ 28,700	*	—
Other insulated wires and cables	224,688	− 59,250	£22,425	− £31,197
Radio receivers, not radiograms (excluding valves)	28,981	+ 8,800	11,384	+ 906
Radio transmitters (excluding valves)	18,069	+ 8,382	*	—
Radio valves	33,339	+ 3,166	10,461	− 18,454
Other radio parts and accessories	48,079	+ 7,266	65,340	− 31,430
Telegraph and telephone apparatus (other than radio)	265,761	+ 88,526	*	—
Electric carbons	*	—	4,344	− 15,555
Incandescent lamps	50,290	+ 5,007	8,960	− 6,162
Other lighting apparatus	39,417	− 9,031	40,928	− 8,765
Primary batteries	13,300	− 3,581	*	—
Accumulators	47,057	− 2,253	*	—
Electric cooking and heating apparatus	26,898	+ 834	*	—
House service meters	16,742	− 2,089	*	—
Other electrical instruments	28,202	+ 6,345	28,637	+ 7,023
Insulating materials not elsewhere specified	20,236	+ 6,681	*	—
Unenumerated electrical goods and apparatus	104,712	+ 4,104	62,508	− 7,273
Electric generators up to 200 kW	37,329	+ 3,605	*	—
Electric generators over 200 kW	93,013	+ 67,107	*	—
Electric motors	164,075	+ 58,695	23,830†	− 7,810
Convertors and transformers	117,646	+ 54,350	*	—
Starting and controlling gear for motors	59,096	+ 34,463	*	—
Switchgear	148,318	− 6,606	*	—
Other electrical machinery	14,118	− 169	12,676	− 10,183
Electric vacuum cleaners	26,885	+ 7,285	21,998	+ 9,846
Total	£1,710,189	+£309,551	£313,481	−£119,054

* Not classified separately. † Not railway and tramway motors.

Actually, the value of electrical exports given in the August Board of Trade returns—£1,710,189—is well in excess of that for any similar month for more than ten years, and the advance of £309,551 on the August, 1937, total was equal to 22 per cent. Against this, however, must be set the fact that last month contained an extra working day. Recently the substantial nature of electrical exports has been almost wholly due to large shipments of machinery, but this was not so apparent last month when the increases were more evenly distributed.

Among goods and apparatus, exports of telegraph and telephone equipment continued to show the greatest gain with an advance of £88,526 on August last year. The following analysis shows the chief destinations, with comparative values (August, 1937, in parentheses) :—

Australia, £65,036 (£40,250); South Africa, £21,678 (£17,377); other British countries, £75,679 (£62,244); Argentina, £17,506 (£15,818); and other foreign countries, £85,862 (£41,546); total, £265,761 (£177,235).

There was also a substantial expansion in the value of telegraph and telephone wires and cables sent to overseas markets, but shipments of other types of cable further contracted. The chief destinations of the latter were as follows :—

Rubber-insulated wires and cables.—Australia, £25,562 (£36,781); South Africa, £18,528 (£20,930); British India, £17,982 (£14,446); New Zealand, £6,013 (£7,623); other British countries, £14,555 (£18,160); and foreign countries, £11,899 (£16,084) total, £94,539 (£114,474).

Electric wires and cables, insulation other than rubber.—Australia, £30,120 (£34,077); South Africa, £26,378 (£54,396); British India, £25,372 (£31,656); other British countries, £30,554 (£28,490); and foreign countries, £17,725 (£20,845); total, £130,149 (£169,464).

Among the twenty-one classes into which articles wholly or mainly manufactured are divided in the Board of Trade returns, only machinery showed an improvement in July and last month the high level of exports of this kind continued. Countries chiefly responsible for this were Russia, British India, Iran and South Africa. Up to the present Russia has this year taken delivery of British machinery worth £1,689,559 against £424,179 in the corresponding period of last year. Shipments to the four countries mentioned, with comparative values for August, 1937, in parentheses, were as follows :—Russia, £315,048 (£71,161); British India, £675,837 (£568,297); Iran, £100,640 (£32,124); and South Africa, £559,574 (£480,166). The recovery in Italian participation in the machinery market previously noted was maintained in August (£50,691 against £22,718, bringing the total for the eight months to £567,934, compared with £138,494 up to the end of August last year).

So far as directly electrical machinery is concerned, there were substantial increases in most classes. Considerably more than twice as much generating plant has been sent to South Africa this year as in the same period of 1937, and last month exports to the Union were valued at £25,560 against £5,531 in August, 1937, and £1,543 a year previously. South Africa has also been an important market recently for transforming plant, &c. On the other hand, Australia has been a better customer for motors, last month's shipments to the Commonwealth totalling £38,140 against £18,871 in August, 1937.

While the United States did well last month other suppliers of electrical equipment found the British market considerably less profitable. Imports were worth £313,481, or £119,054 (27 per cent.) less than in August, 1937, the major decreases being in cables and radio apparatus. Instrument imports were of a higher value than a year ago, but lower than in July. On the other hand vacuum cleaners show an increase on both counts.

The chief sources from which electrical goods and apparatus were obtained last month and in August, 1937, were as follows :—United States, £81,400 (£79,146); Germany, £56,259 (£90,060); Netherlands, £37,532 (£79,485); Belgium, £14,590 (£31,668) Switzerland, £11,270 (£16,866) France, £6,866 (£7,359); Austria, £3,365 (£7,261); other foreign countries, £28,466 (£38,793); and British countries, £15,229 (£15,246); total, £254,977 (£365,884).

TABLE II.—BRITISH ELECTRICAL EXPORTS DURING AUGUST

Destination.	Goods and apparatus, Aug., 1938.	Inc. or dec. compared with Aug., 1937.	Electric generators, Aug., 1938.	Inc. or dec. compared with Aug., 1937.	Electric motors, Aug., 1938.	Inc. or dec. compared with Aug., 1937.	Other electrical machinery, Aug., 1938.	Inc. or dec. compared with Aug., 1937.
Eire	£37,445	+ £8,442	*	—	*	—	*	—
Channel Islands	11,864	+ 1,196	*	—	*	—	*	—
Palestine	9,809	− 11,845	*	—	*	—	*	—
British West Africa	12,563	+ 3,015	*	—	*	—	*	—
Union of South Africa	128,676	− 23,384	£25,560	+£20,029	£24,228	+ £2,793	£112,766	+£43,711
British India	115,687	+ 8,944	13,444	+ 10,914	18,861	+ 5,305	64,769	+ 28,626
British Malaya	21,308	− 4,373	*	—	*	—	9,139	+ 2,518
Ceylon	22,077	+ 15,192	*	—	*	—	*	—
Hong Kong	17,459	+ 10,912	*	—	*	—	*	—
Australia	175,069	+ 16,136	6,051	+ 182	38,140	+ 19,269	18,977	− 23,032
New Zealand	79,585	− 7,859	*	—	6,217	+ 1,591	12,908	− 2,866
Canada	11,439	− 696	1,502	− 5,134	2,279	− 8,794	3,078	− 4,266
Other British Countries	56,216	+ 14,879	53,941	+ 37,699	26,899	+ 15,681	41,422	+ 9,434
Sweden	11,139	+ 118	*	—	*	—	*	—
Denmark	17,665	− 2,702	*	—	*	—	*	—
Netherlands	10,011	+ 759	*	—	*	—	4,522	+ 1,256
Belgium	9,902	− 6,017	*	—	*	—	*	—
France	13,788	+ 3,903	*	—	*	—	2,520	− 55
Portugal	4,028	− 9,447	*	—	*	—	*	—
Spain	204	− 2,792	*	—	*	—	*	—
Italy	7,802	+ 3,411	*	—	*	—	*	—
Greece	3,509	+ 347	*	—	*	—	*	—
Rumania	32,853	+ 4,727	*	—	*	—	1,503	+ 8
Egypt	13,750	+ 7,766	*	—	*	—	2,870	+ 1,310
China	3,951	− 29,676	*	—	*	—	*	—
Brazil	17,355	+ 11,642	*	—	*	—	15,057	+ 9,826
Argentina	30,140	− 2,054	*	—	*	—	49,647	+ 15,568
Other Foreign Countries	174,415	+ 80,277	29,844	+ 7,022	47,451	+ 22,850	£339,178	+£82,038
Total	£1,049,709	+£90,821	£130,342	+£70,712	£164,075	+£58,695		

* Not classified separately. Vacuum cleaners are included in Table I but not in Table II.

New Books

Direct and Alternating Currents. By E. A. LOEW. (Pp. 730; illus.) London: McGraw-Hill Publishing Co., Ltd. Price 25s.

THE science of electrical engineering has developed with such rapidity in recent years that it has become almost impossible to deal with it with any degree of completeness between the covers of a single book. The author has, however, essayed this task and it must be admitted that he has succeeded admirably. Although the title is not aptly chosen, the whole realm of d.c. and a.c. engineering has been surveyed within the limit of 730 pages, with the exception of what we may term the engineering of micro-currents. The scheme is intended, so the author informs us, primarily for students desiring a short survey course in the theory of the electric circuit and the operating principles of electrical mechines. Recognising the difficulty of attempting to cover the fields of d.c. and a.c. theory as well as of machinery in a single volume, he gives only such of the fundamental laws and principles as are necessary to the understanding of the design, construction and performance of those types of machines met with in commercial practice.

The subject matter is divided into two parts comprising no fewer then thirty-three chapters, the first six of which, in Part I, deal with general principles, such as Ohm's Law, energy and power calculations, the magnetic circuit, electromagnetic induction and so on, after which the various kinds of d.c. machine can be readily understood. In Part II the same procedure is adopted, the general principles—including a discussion of vector representation—being given before the various types of a.c. machine are discussed. Space is also found for a brief description of the problems of distribution as well as of measuring instruments. A comprehensive index greatly facilitates reference to any particular subject. Throughout, the mathematics has been reduced to its simplest forms, and where possible fully worked out. Numerical exercises are included, and additional exercises are given at the end of the chapter; it is to be regretted that the answers to these are not appended.—A. R.

Electrical Technology. By H. COTTON. Third edition. (Pp. 523, figs. 423.) London: Sir Isaac Pitman & Sons, Ltd. Price 12s. 6d.

The success which has attended the earlier editions of this well-known work is in itself a sufficient recommendation for this, the third edition. As the book was primarily written to cover the syllabus of the subject of electrical technology for the University of London engineering degree, the author has followed the modification of this syllabus by a suitable revision of the text. The sections dealing with electric furnaces and electrical oscillations have been omitted as outside the scope of the work.

The new matter is very acceptable and conforms to the previous high standard. One of the new sections, that of "Systems of Conductors," is somewhat brief in treatment. The remainder consist chiefly of an extension of the chapter on electromagnetism by the addition of elementary material and a new chapter on electrostatics.

The scope of the book is wide and the author is to be congratulated on the adequate manner in which such a range of subjects is dealt with. Superfluous descriptive matter is rigorously excluded; the text and diagrams are very clear.

Of course in a book of such wide scope, it is hardly to be expected that all sections are equally treated. We think that the section dealing with the introduction to the symbolic method of a.c. calculations might well be amplified, in view of its importance. In the same way, the mention of a.c. bridge networks as an illustration of the symbolic method is of doubtful value, owing to its brevity.

There are certain small errors such as, for example, on p. 162, where fig. 98 should read fig. 127, but these are few. The book can be thoroughly recommended as a students' textbook.—S. P. S.

Electrical Engineering Practice—Vol. I. Fifth edition. By J. W. MEARES and R. E. NEALE. (Pp. 780; illus.) London: Chapman & Hall, Ltd. Price 25s.

This work is intended as a practical treatise for electrical, civil, and mechanical engineers. Vol. I, now before us, has reached the fifth edition, and it contains the parts which deal with definitions, materials, measurements; generation, prime movers, sale of electrical energy; transmission and control. An idea of the change from the fourth edition may be gained from the increased length of nearly 200 pages; also, a comprehensive index to all three volumes is now provided. The latter extends to 70 pages and the references are to paragraphs, not pages. Even so, we should imagine such a combined index may prove awkward as new editions of the several volumes appear, unless the authors intend to restrict themselves to the present paragraph numbers for all time. A pleasing feature of the present book is its binding, which is not only strong and serviceable, but permits the book to remain open at any desired place.

With regard to the contents, these are miscellaneous both in character and value. The book, however, is not planned along normal lines. Alongside excerpts from standard publications there are descriptions of varying length of machines and apparatus. Insufficient care has been devoted to the bibliographies as regards either selection or accuracy. Some of the references are to works long superseded or replaced by later editions; *e.g.*, "The Dynamo," L. G. Hawkins and F. Wallis (2 vols.). Other mistakes seen at a glance are "Claton" and "Godlet." On one page two references are given to Professor Cramb in the I.E.E. *Journal*—on checking these, it is found that one is not there and the other is presumably a paper by Professor Cramp. Reference to papers in the I.E.E. *Journal* is to be commended, but some of the selections seem to be about as useful to the practising engineer as the description of the homopolar generator.

In the chapter on tariffs—admittedly a difficult subject—more sifting and modernising might be expected. Also, when speaking of the Glasgow system, mention might be made of the domestic tariff which ultimately falls to four kWh a penny. Rural charges also deserve close study, particularly in view of widespread anomalies.

It is rather difficult to assess the value of a book which is hardly a textbook or a treatise. Despite the lengthy excerpts and numerous tables from official publications and regulations, the reader is referred to the latter for commercial use. The volume certainly contains a vast amount of valuable information and data; but whether an engineer might not be better served with textbooks, pocket-books and official publications is a moot point.—S. P. S.

Die Trockengleichrichter. By ING. KARL MAIER. (Pp. 313; figs. 312.) Munich: Verlag R. Oldenbourg. Price Rm.18.

This is a book that is full of interest and merit. It is conveniently arranged, clearly written, excellently produced and deals with a subject—dry rectifiers—of which there has hitherto been a dearth of systematic and collected treatment suited to the importance of the apparatus concerned. The author has been specially associated with the development of selenium rectifiers, and hence finds it more convenient to base his treatment of theory and principle largely upon the characteristics of this type. He is, however, careful to state that this implies no superiority compared with other dry rectifiers, and numerous examples of applications of different types are illustrated impartially.

A specially valuable feature is that data and methods for the quantitative design of dry rectifiers are presented systematically in a way that makes the book equally useful for continuous study or reference on individual points. The advantages and disadvantages of dry rectifiers are stated quite specifically, and equally definite information is given concerning the usual voltage and current limits of their utility compared with other types of rectifiers. The first part of the book deals with the principles of dry rectification, and various methods of connection and loading; and the second part deals with construction, applications and performance. There is a minimum of theoretical and mathematical matter. Throughout, the treatment is explicit and likely in every instance to tell the practical engineer just what he wants to know.—R. E. N.

Wireless Servicing Manual. By W. T. COCKING. (Pp. 288; illus., fourth edition). London: Iliffe & Sons, Ltd. Price 5s.

The fact that this handbook has reached the fourth edition stage is sufficient indication of its worth. It has now been enlarged by the addition of 50 pages of new matter. An extra chapter deals with television receivers and the appendices have been extended to include instructions for building a resistance and capacity testing bridge and a valve testing bridge. Data relative to valve-base connections, colour codes, &c., have been carefully revised.—W. O. F.

Radio Laboratory Handbook. By M. G. SCROGGIE. (Pp. 384; figs. 211.) London: Iliffe & Sons, Ltd. Price 8s. 6d.

This is an entirely new book by a well-known writer. It has been specially compiled for amateurs, both beginners and advanced workers; but it should also be of material utility to industrial and official laboratory engineers.

Since instruments and methods of using them are written about from first-hand experience, the author has been able to exclude those that seem to involve undue expense or difficulty. Fundamental principles and details are discussed, both quite fully; and though advanced work is dealt with, a high degree of prior knowledge is not assumed. The book will thus be particularly valuable to schools and colleges conducting experimental radio classes.—W. O. F.

Shorter Notices

The Regent Street Polytechnic inaugurated in 1935 an annual series of lectures known as the Studd Lectures on industrial and business management. The fourth series, which has just been published by Management Journals, Ltd., deals with administration and its relation to the individual, society, capital and the State, and are by Mr. F. Pick, Mr. L. Urwick, Dr. W. H. Coates and Sir Henry Bunbury respectively.

The Scientific Book Club has sent us examples of two of its monthly choices; they are "Man in a Chemical World," by A. Cressy Morrison; and "Scientific Riddles," by Sir J. Arthur Thomson. They appear to be good value for half a crown each, which is all the members are called upon to pay. W. & G. Foyle, 119-125, Charing Cross Road, W.C.2, are the sponsors of the scheme.

Business and Industrial Notes

New London Lighting Fittings Showroom. Telephone Manufacture in India. E.D.A. Activities. More Lamp Publicity Material. Prices of Materials

Telephone Manufacture in India

FOR the first time India will soon be manufacturing telephone apparatus on a large scale in the Government telegraph workshops at Calcutta. Mr. A. Brokenshaw, Chief Engineer, Posts and Telegraphs, recently visited Calcutta and discussed the arrangements for launching a mass-production scheme for the manufacture of telephones in the workshops. The telegraph workshops at Calcutta have been manufacturing telegraph apparatus for the last fifty years, but this will be the first time that the production of telephones will also be undertaken. The importance of these workshops has been continually increasing owing to the policy of the Posts and Telegraphs Department of manufacturing as much of its requirements as possible, with due regard to economy and efficiency of production. Experimental telephones have already been put into use in New Delhi and have proved entirely successful. For the present, more technical apparatus will have to be imported till such time as arrangements are made for their manufacture in India. It is also the aim of Mr. Brokenshaw to incorporate all the latest devices in these Indian-made telephones without using any patents on which royalty will have to be paid. For this, further research work is proceeding.

B.I.F. Publicity

"Big Ben," with Boadicea's statue in the foreground, is a striking and appropriate decoration for a B.I.F. menu card, 195,000 of which will shortly be distributed in seven European countries, Argentina, Chile, Brazil, the British West Indies and British East Africa. In addition, this card, printed in nine languages, will be used on British and Continental airway lines and on cross-Channel and other steamship services to the Continent. Thirteen thousand cards in eight languages will be issued to nine countries, and 3,000 B.I.F. blotters are being distributed among Italian firms.

Change of Name

The title of British Sangamo Co., Ltd., has been changed to Sangamo Weston, Ltd.

Lighting Trades' New Showroom

Showrooms for the display of electric lighting fittings and electric fires have been in existence at the Farringdon Road establishment of Lighting Trades, Ltd., for many years, but the increase in the electrical business of the company has necessitated the opening of a third showroom for the use of the trade at the same premises, and this was formally inaugurated by the Mayor of Holborn (Councillor Roberts) on Monday last. It has an attractive colour scheme of cream and pale green, while around the walls there is a low shelf on which are displayed a variety of table lighting fittings.

A view of part of the new electrical fittings showroom of Lighting Trades, Ltd.

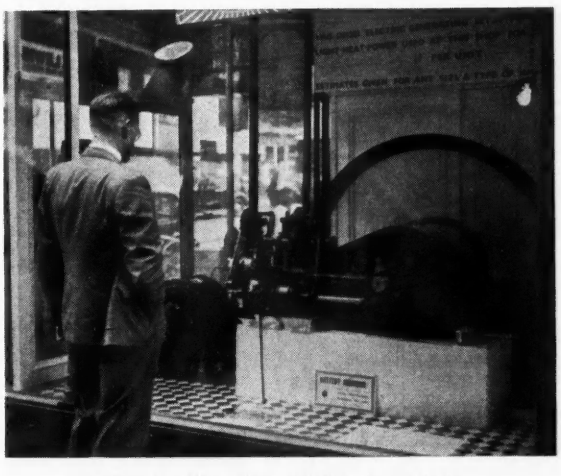
There are also many attractively designed wall fittings, pendant fittings and floor standards, and altogether there are over 300 designs from which to choose. The new showroom seen in conjunction with the two previously opened, demonstrates that the company is now equipped to deal with demands for almost any type of electrical fitting. The builders of the new showroom were Linterns, Ltd., and the electrical installation was carried out by W. J. Kirby & Co.

Decoration Lamps

A set of "fairy lights" is among the new decoration lamp outfits introduced by the General Electric Co., Ltd. This set comprises twelve cone-type "Osram" lamps in assorted colours, and is for 200/250 V. It is supplied complete with decorative flex, bakelite lampholders and adaptor. "Party lights," another new line for this season, are primarily intended to appeal to children. This set comprises twelve coloured bell-shades illustrated with nursery rhyme designs and illuminated by clear cone-shaped "Osram" decoration lamps. This set also operates off a 200/250-V supply. Among last year's lines which are being continued are the "Christmas lights" and the "Christmas tree table centre." Outstanding in this year's new productions is the set of "Decoration lights." This has been redesigned and reboxed. Two voltage ranges are available, the No. 3 outfit for 200/230 V and the No. 4 for 240/260 V.

A Novel Power Plant Installation

When a new branch of the Lancaster Electrical Co. was planned for St. Albans, Mr. Lane, the proprietor of the firm decided to install Diesel plant to reduce power costs. In the



A Ruston oil engine installed in a window

new premises, space was a problem. There were, however, the window spaces, and it was decided to install a small horizontal oil engine and generator in one of these. As our picture shows, the installation not only provides electricity required for the premises but is also an excellent medium for attracting the attention of passers-by. The unit installed is a Ruston 8-b.h.p. horizontal oil engine coupled by vee-rope drive to a 4¼-kW d.c. generator. It is noiseless in operation and causes no disturbance or vibration inside or outside the shop.

A Large Rectifier Order

An order has recently been received by the Westinghouse Brake & Signal Co., Ltd., from R. A. Lister, Ltd., for a 15,000-A rectifier consisting of three separate 6 V 5,000 A sections each with its own transformer. Control of current is by means of two tapping switches operating on an auto-transformer. The rectifier will be used for supplying electricity for the deposition of chromium in the cylinders of internal combustion engines to prevent wear.

Overhead Line Regulations

A useful book has recently been published by the International Electrotechnical Commission under the title: "Comparison of the Regulations in Force in Various Countries for the Erection of Overhead Lines" (Publication 49). A French edition of such a comparison has been available for some years, but the present edition, which is available in English, has been thoroughly revised to bring it up to date, and to include particulars relative to countries whose rules were not previously included. The national regulations now analysed are those of the following countries: Australia, Belgium, Canada, Czechoslovakia, France, Germany, Great Britain, Holland, Italy, Japan, Norway, Poland, Roumania, Spain, Sweden, Switzerland and the United States. Copies may be obtained from the general secretary of the I.E.C., 28, Victoria Street, S.W.1, price 5s. 6d. post free.

A Valuation Appeal

At Fife County Valuation Appeal Court on September 16th the Electricity Supply Corporation, Ltd., appealed against an increase in the valuation of electricity works and mains at Largo Road, St. Andrews. Some time ago the company decided to discontinue the generation of electricity and to take a bulk supply. In order to do this it had to change over from d.c. to a.c., which involved the disuse of a large amount of plant, valued at about £10,000. This plant had previously been regarded as part of what is known as "tenant's chattels" in arriving at the valuation of the undertaking and a percentage allowance had been made in the computation for valuation purposes. The company claimed that until it had finally written off from its books the whole of this £10,000 it should still be regarded as tenant's capital. The Assessor held that,

as the plant was no longer used for the purposes of the undertaking, it could no longer be regarded as part of that capital. The appeal also referred to the expenditure of £8,000 for the purpose of adapting plant, such as electric motors and radio sets, in the consumers' own premises to suit the new system of supply. The Assessor claimed that this should not be regarded as tenant's capital, but as being an initial outlay in connection with the change-over. The company's contention, however, was that this sum was a necessary expenditure and still represented part of tenant's capital. The Court dismissed the appeal in regard to the £10,000, but upheld the contention of the company in regard to the £8,000. Cross appeals against the Court's decision were intimated by Counsel for the Electricity Supply Corporation and the Assessor.

New Switchgear Offices at Chelmsford

Great care has been taken in the design and equipment of the new switchgear offices of Crompton Parkinson, Ltd., at

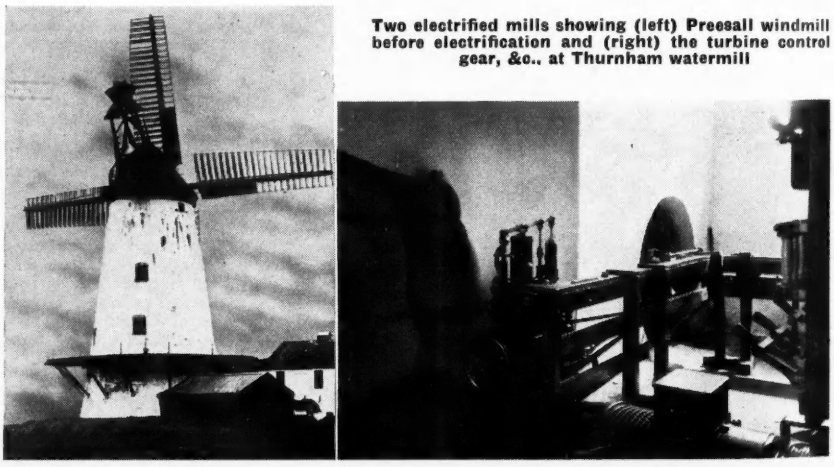
A section of the new switchgear offices of Crompton Parkinson, Ltd., at Chelmsford

Chelmsford, in an endeavour to make working conditions healthy and pleasant, and so conducive to a high standard of output. The questions of reducing noise to the minimum, providing adequate shadowless lighting, and keeping the air and temperature normal, all received individual consideration. An important point is the daylight and artificial lighting of the drawing office. The north lights were carefully studied to give good reflected light, and for artificial illumination trough reflectors are in use, eliminating shadow and glare, and giving a good all-round working light. The drawing boards as illustrated have sliding straight edges and can be used either vertically or horizontally as required. The flooring throughout the building is finished with rubber, and in consequence noise is greatly reduced.

Ancient and Modern

The water-turbine at Thurnham mill, now shares the load with a 55-h.p. slip-ring motor supplied from the mains of the City of Lancaster; in dry seasons the latter provides all the power for grinding the corn. The turbine was installed in 1924, replacing a water-wheel more than 150 years old. The installation includes a 200-Ah battery for lighting and an 11-kW charging generator.

Preesall windmill, near Fleetwood, which was built in 1830, has been deprived of its sails, and the electricity is obtained from Preston Corporation. A 35-h.p. slip-ring motor drives the grinders, splitters, sifters, &c.; a 6-h.p. machine works a hoist contactor-operated by push buttons on each floor, while a 5 h.p. motor with star-delta starter operates a mixing machine. There are about forty lighting points. In both cases the electrical work was carried out by Pye Motors, Ltd., and Callender's cables were used; in the first they were three-core cables, lead-sheathed, single-wire armoured and in the second v.i.r. cables.



Two electrified mills showing (left) Preesall windmill before electrification and (right) the turbine control gear, &c., at Thurnham watermill

The Birmingham Electric Club

The opening meeting of the Birmingham Electric Club for the 1938-39 session will be held on September 26th at the Grand Hotel, Birmingham, when Mr. J. Eden will give a lecture on "Electrode Water Heaters and Steam Raisers." Other meetings during the session are as follows:—October 14th: Ladies' evening. October 24th: "Electrical Drives in Heavy Industries," by Mr. H. S. Carnegie. November 28th: "Electricity in Agriculture and Horticulture," by Mr. F. E. Rowland. December 19th: Annual general meeting. January 30th: Presidential address. February 27th "Sources of World Power Supply," by Prof. W. Cramp. March 3rd: Annual dinner. May 5th (provisional): Annual visit.

Switchgear Manufacturers' Apprenticeship Scheme

We have received from Brookhirst Switchgear, Ltd., an interesting booklet entitled "Satisfaction *versus* Safety in a Career." This booklet is designed to give a boy and his parents information to help them decide whether he is likely to be fitted for an engineering career, and while the facts refer primarily to Brookhirst Switchgear, Ltd., the arguments apply equally to many other industrial undertakings. The contents outline the training an apprentice would receive, the organisation of which he would form a part and, as far as possible, the spirit in which he should commence this career.

The Kettering Radio Exhibition

Kettering Radio Society's sixth annual three-day radio exhibition was opened at the Central Hall, Kettering, yesterday (Thursday) and continues to-day and to-morrow. The exhibition, as usual, is being run on "Radiolympia" lines, and practically every radio retailer in the district is represented. Television demonstrations are given in a well-appointed theatre, and an "Emitron" television camera is on view. Other attractions include continuous free cinema shows, and demonstrations of a gas-operated radio set. Variety shows are given twice nightly in a studio and broadcast through amplifiers in the main hall.

Japanese Electric Motor Industry

It is reported from Tokyo that the construction of electric motors is to be placed by the Minister of Industry under the control of a special organisation so that preference in deliveries may be given to the armament and other important industries. At present construction is chiefly in the hands of five concerns and the private demand is particularly large owing to the restriction in the consumption of oil and the difficulties encountered in obtaining supplies of coal.

E.D.A. Activities

A preliminary announcement with regard to the calendar for 1939 is made in the October sales and publicity programme of the British Electrical Development Association. The calendar will be based on similar lines to "Lighting Through the Ages," which proved so successful. This year's calendar will have as its theme "Power Through the Ages" and will consist of twelve full-colour drawings each depicting some form of power. Specimen calendars will be available shortly and in the meantime a price list is given for various quantities so that members can make provision for the coming season. The programme also illustrates three folders for enclosure with accounts. These are in colour and deal with electric cooking, water heating and wiring respectively, space being provided on the back page for overprinting details of hire charges, tariffs, &c., and name and address. Stereos are available for linking up with the National "Better Light—Better Sight—Better Health" campaign, and three examples of these are illustrated. The E.D.A. processional car is to be retained in commission during October, and there are still a few dates open for that month.

Mr. E. M. Ackery, of E.D.A., lectured to the Mid-East Area conference of chief engineers and principal members of their staffs at Leeds on September 14th. His lecture was illustrated by lantern slides. An air-conditioning unit was on exhibition. Keen interest was shown in the lecture and a good discussion took place. Mr. G. A. Vowles, of Halifax, the chairman of the Area Committee, presided, and he was able to quote valuable experience of air conditioning in his own offices and in a large toffee works at Halifax. Several chief engineers present made contributions to the debate.

The Association, which is co-operating with twenty-three

well-known concerns to organise at the Woman's Fair and Exhibition, Olympia, in November, the biggest electrical display ever staged, is itself planning four stands which will provide a striking introduction to the electricity section. Visitors entering the grand hall will see a 42-ft. colonnade surmounted by a twenty-one foot statue of Venus which has been planned by Mr. King-Morgan, a London engineer, and designed by Barney Seale, the sculptor. Running in a semi-circle from the colonnade will be E.D.A.'s own stands—four of them demonstrating home life, health and beauty, power in the home, and heat in the home. The home life stand will embody a living room, nursery, bedroom, bathroom, kitchen and home laundry.

In view of the manufacturers' display in the remainder of the section E.D.A. will avoid, as far as possible, a display of apparatus in these rooms. There will probably be a "hidden voice" commentary on the uses to which electricity can be put in the various rooms. On the health and beauty stand there will be demonstrations of woman's work in the electrical industry. How electricity can be an aid to beauty and its part in hairdressing will also be demonstrated. At the back of the power stand will be a mural display showing how electricity comes into and is distributed through the house. On this stand will be demonstrated electric cleaners, polishers, refrigerators, fans, telephones, radio and television. The mural display on the heating stand will show how hot water is obtained. All the latest developments in heating apparatus will be shown, including convector heaters, electric fires, towel rails, water heaters, kettles and cookers. At one entrance to the exhibit will be wall cases on each side, one showing how electricity is generated and the other how it is distributed. At the other entrance will be a display of flowers which will illustrate the ways in which electricity can be used as a means of helping horticulture.

The following companies are exhibiting: Belling & Co., Ltd.; Berry's Electric, Ltd.; Bulpitt & Sons, Ltd.; E. K. Cole, Ltd.; Corfield-Sigg, Ltd.; English Electric Co., Ltd.; Ferranti, Ltd.; General Electric Co., Ltd.; Hague & McKenzie, Ltd.; Hanovia, Ltd.; Harcourts, Ltd.; Horstmann Gear Co., Ltd.; Hotpoint Electric Appliance Co., Ltd.; Hurley Machine Co., Ltd.; Jackson Electric Stove Co., Ltd.; Moffats, Ltd.; Rubery Owen & Co., Ltd.; Stokes Appliances, Ltd.; and the Electric Lamp Manufacturers' Association.

Sunbeam Trolley Buses

It was recently announced by Rootes Securities, Ltd., that Sunbeam Motors, Ltd., and Clement Talbot, Ltd., would in future operate as Sunbeam-Talbot, Ltd., with chief works and registered office at Barlby Road, North Kensington, London, W.10. The merging of these two companies does not affect Sunbeam Commercial Vehicles, Ltd., the manufacturers of Sunbeam trolley-buses and battery vehicles. The registered office and works of this company, which is also associated with Rootes Securities, Ltd., are at Moorfield Works, Wolverhampton, and the whole of its manufacturing activities are concentrated there.

Discharge Lamps at Bournemouth

The Bournemouth and Poole Electric Supply Co., Ltd., has recently placed an order with the General Electric Co., Ltd., for a number of "Osira" mercury vapour electric-discharge lamps for the lighting of Christchurch Street. These will be housed in G.E.C. "Di-fractor" lanterns of the type used throughout Fulham. The body of the lantern is of heavy gauge copper with porcelain enamelled steel inner and outer reflectors. A single piece prismatic bowl refractor which also acts as a dustproof outer globe is fitted.

French Guarantee Mark for Radio Sets

Two years ago the French Union Technique des Syndicats de l'Electricité published under the ægis of the Comite Superieur de Normalisation of the French Ministry of Trade and Commerce a booklet setting out the technical requirements to ensure safety of operation of radio receiving sets, amplifiers and loud speakers operated from electric power distributing mains. With the object of stressing the need for the public to purchase only such sets and apparatus that fulfil these requirements it has recently been decided by the Union Technique to set up a department for the testing of such sets and for stamping those passing the tests with a "Marque de Securité U.S.E." The new department, which is to commence its work towards the end of the present year or at the beginning of 1939, will be controlled by a board of experts specially appointed by the Union. English manufacturers of radio material interested in the scheme can obtain particulars from the Union at 54, Avenue Marceau, Paris.

Model Engineering Exhibition

As usual, electric drive was much in evidence at the "Model Engineer" Exhibition at the Horticultural Hall, although the electric train has obviously not the romantic appeal of the steam engine where model-making is concerned, for there was none in the model section. Small motors for various purposes, electric tools of all kinds and lathes with built-in motors were in evidence, and electricity is normally employed for the miniature model railway, some of the switchboards for points and signals, &c., being quite a work of art. The exhibition closes to-morrow at 9.30 p.m.

The New Cosmos Lamp Calendar

The new Cosmos lamp calendar for 1938-39, which we have just received from the Metropolitan - Vickers Electrical Co., Ltd., is similar in form to those which the company has been issuing for some years past. The portrait of the charming lady which adorns the new calendar is a worthy addition to this popular series.

The 1938-39 Cosmos calendar

Canadian Tariff Change

The Department of National Revenue, Canada, announces that the articles specified in tariff item 438c. are subject to reduced rates of duties of customs when imported for use as original equipment by a manufacturer of automobiles, motor vehicles, trolley buses or chassis, enumerated in tariff items 438a and 424. The new duties are: British preferential tariff, free. Intermediate tariff, free. General tariff, 25 per cent. The Order in Council is effective on and after September 3rd.

French Domestic Electrical Imports and Exports

The accompanying table shows the French imports and exports of domestic electrical appliances during the first half of 1937, as compared with the first six months of last year. The French franc values have been converted to sterling at 178 to the £. As will be seen, both sections of the trade show a larger total, imports having advanced by £51,786 and exports by £26,287.

Imports.	1936. 1,000 fr.	1937. 1,000 fr.
Electric fires and stoves	6,616	4,330
Electric irons	415	119
Electric vacuum cleaners, boot cleaners, etc.	5,306	2,752
Electrical refrigerators, etc.	15,598	11,812
Electric fans	723	427
Total francs	28,658,000	19,440,000
Total at 178 francs to £	£161,000	£109,214
Exports.		
All classes of domestic electrical appliances, in francs.	14,681,000	10,002,000
Total £	£82,478	£56,191

Light-ray Control

A thirty-page illustrated booklet, bound in cloth, has been issued by Radiovisor Parent, Ltd., patentees and manufacturers of apparatus controlled or actuated by light rays, describing some of the numerous ways in which these devices are now being used. The light-sensitive element employed is a selenium cell that is able to stand up to normal commercial voltages and remain in closed circuit for long periods.

An Egyptian Building Display

We have received from the Building Bureau of Egypt, Royal Exchange Building, P.O. Box 165, Cairo, particulars of its plans for setting up a permanent exhibition of building materials, equipment, &c., somewhat on the lines of the Building Centre in London. It is hoped to secure a representative display of British electrical products.

E.A.W. Activities

An informal debate "That the All-electric house is entirely satisfactory" and talks by Professor Winifred Cullis on "Good Health Factors," Miss Caroline Haslett on "Electricity in the Service of Women," and Mr. E. M. Ackery (E.D.A.) on "Air Conditioning," are outstanding features of the autumn programme of the London Branch. The arrangements for visits, lectures, demonstrations and social events appear more than usually attractive. A lecture-demonstration by Mr. D. G. W. Ackworth (G.E.C.) on "Thermostatic Control of Ovens" is of particular interest in the fixtures of the Teachers' Circle, which also include a lecture, held jointly with the Demonstrators' Circle on "Industrial Cooking Equipment" given by Mr. F. H. Bellamy (Jackson Electric Stove Co.).

The Central England Federation of the Electrical Association for Women is holding a one-day conference at Rugby on October 5th. In the morning a visit will be made to the new lamp works and welding shops of the British Thomson-Houston Co., Ltd., and following lunch at the Co-operative Hall there

will be an afternoon session at which Miss Edna Moseley, A.R.I.B.A., will give a lecture on "How the E.A.W. can help the Architect and Builder in Leading the Public to Accept the Electrical Home." The talk will be illustrated by a special demonstration kitchen arranged by the B.T.H. Co., with apparatus which will be rearranged by Miss Moseley.

The Dramatic Circle of the E.A.W. London Branch urgently require men for parts in a dramatic performance to be given on November 30th and December 1st. Volunteers are asked to write at once to Mrs. Doris Watts, hon. secretary, 20, Regent Street, S.W.1.

"Ediswan" Lamp Publicity

The principal items of interest in the lamp publicity campaign of the Edison Swan Electric Co., Ltd., for the forthcoming season are the 60th anniversary commemoration of the first lamp, the introduction of a side index into the general catalogue make-up, a window display with a centre-piece which may be used independently as a window centre, both being more elaborate than of recent years, "precision focusing" incorporated in the motor lamp folder and an adaptation of last year's E.L.M.A. slogan which is a step further, in the phrase "Better sight *through* better light." The general lamp catalogue, covering the wide range of "Royal Ediswan" lamps is a 56-page booklet, and the cover links up with the window display by incorporation of the slogan. There are also a general lamp folder, a window bill for lamps and a motor lamp data card which gives tabulated information relating to the new reduced prices.

Wages in the Cable-making Industry

The Joint Industrial Council for the Electrical Cable Making Industry announces that the "cost of living" figure on September 1st (56 per cent. above the 1914 level), will not involve any alteration in wages on the third pay-day in October.

The Manchester Radio Exhibition

The *Evening Chronicle* Manchester Radio Show opens on Tuesday next and will continue until October 8th. As in previous years a luncheon given by the *Evening Chronicle* will be held at the Midland Hotel on the opening day.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, ETC.	Price September 20th.	Fortnight's inc. or dec.
a Acid Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£37	—
a Ammonia, Muriate (large crystal) ... ,,	£18 10s.	—
a Borax ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£19	—
a Potash, Chlorate ... ... per lb.	3¾d. to 4¼d.	—
a ,, Perchlorate... ... ... ,,	6d.	—
a Shellac ... ... per cwt.	£4 8s.	—
a Sulphur, Commercial ... ... per ton	£11	—
a ,, Roll ... ... ,,	£11	—
a Soda, Chlorate ... ... per lb.	3¼d. to 3¾d.	—
a ,, Crystals ... ... per ton	£5 to £5 5s.	—
a Sodium, Bichromate, casks ... per lb.	4¼d. net.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£94 to £99	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil ... ... ,,	1/8 to 2/9	—
p Babbits Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£181	—
Grade II ... ... ,,	£127	—
Grade III ... ... ,,	£76	—
c Brass (rolled metal 2" to 12" basis)... per lb.	8¼d.	¼d. inc.
c ,, Tubes (solid drawn) ... ... ,,	11¼d. to 11¾d.	—
c ,, Wire, basis ... ... ,,	8¼d.	¼d. inc.
c Copper Tubes (solid drawn) ... ,,	1/0½d.	¼d. inc.
g ,, Bars (best selected) ... per ton	£80	£4 inc.
g ,, Sheet... ... ... ,,		
g ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars ... ... ,,	£49	£3 inc.
d ,, ,, Wire Rods ... ,,	£53 15s.	£3 inc.
d ,, ,, H.C. Wire ... per lb.	8d.	⅛d. inc.
f Ebonite Rod ¼" dia. & up. ... ... ,,	1/10 to 2/5	—
f ,, Sheet ⅛" thick & up ... ... ,,	1/5 to 1/10	—
n German Silver Wire, Nos. 1 to 12 ... ,,	2/4	—
h Gutta-percha, fine ... ... ,,	nom.	—
h India-rubber, Para-fine ... ... ,,	7¾d.	—
i Iron, Pig (Cleveland, No. 3) ... per ton	£4 5s.	—
i ,, Wire galv. No. 1 P.O. Gual. ... ,,	£23	—
g Lead, English Pig ... ... ,,	£18	£1 15s. inc.
g Mercury ... ... per bot.	£13 10s.	—
e Mica (in original cases) small ... per lb.	10d. to 2/-	—
e ,, ,, ,, medium ... ,,	6/- to 12/6	—
e ,, ,, ,, large ... ,,	13/- to 17/6 up	—
p Phosphor Bronze, plain castings ... ,,	1/2¼	—
p ,, ,, drawn bars & rods ,,	1/0¼d.	¼d. inc.
p ,, ,, rolled strip & sheet ,,	11¼d.	¼d. inc.
p ,, ,, wire ... ... ,,	1s. 1¼d.	¼d. inc.
o Platinum ... ... per oz.	£8	—
d Silicium Bronze Wire ... ... per lb.	9 5/8 d.	⅛d. inc.
g Spelter ... ... per ton	£14 7s. 6d.	£1 5s. inc.
g Tin, Block (English) ... ... ,,	£197 15s.	£5 inc.
n ,, Wire, Nos. 1 to 16 ... ... per lb.	3/6	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g Henry Gardner & Co., Ltd.
h Edward Till & Co.
i Bolling & Lowe.
n P. Ormiston & Sons
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead, rubber, tin and spelter, up to the time of going to press, are given in our "Business Notes" under the same heading.

A.R.P. Warning Syrens

Gent & Co., Ltd., have received the contract from Scotland Yard for equipping the whole of the Metropolitan area with A.R.P. warning syrens. The company's 4-h.p. electro-motor syren has been chosen by the Home Office as the approved type.

A Management Conference

The thirty-ninth Oxford Management Conference will be held from September 29th to October 3rd at St. Hugh's College, Oxford. The conference is promoted by the Confederation of Management Associations and particulars can be obtained from the hon. secretary, Mr. R. Pugh, 52, Grosvenor Gardens, London, S.W.1.

New Catalogues and Lists

Falk, Stadelmann & Co., Ltd., 83/93, Farringdon Road, London, E.C.1.—A 48-page illustrated art catalogue of commercial lighting fittings.

S. Guiterman & Co., Ltd., 35/36, Aldermanbury, London, E.C.2.—An illustrated art catalogue of "Oaklite" lighting fittings.

Higgs Motors, Ltd., Witton, Birmingham.—Catalogue section No. 15 relating to a new patent low starting current squirrel-cage motor.

Elliott Bros., Ltd., Century Works, Lewisham, London, S.E.13.—A leaflet describing an instrument for remote indication of the position of any movable element.

Dowsing Co., Ltd., Kangley Bridge Road, Lower Sydenham, London, S.E.26.—A folder illustrating the company's domestic electrical appliances.

James Beresford & Son, Ltd., Cato Street Works, Birmingham, 7.—Particulars of fire fighting units suitable for A.R.P. schemes.

Donald MacPherson & Co., Ltd., 21, Albion Street, Manchester.—An "Architects' Specification Book" for paints and varnishes which is also useful to works engineers.

Unity Heating, Ltd., Welwyn Garden City, Herts.—A 36-page catalogue of electric space heating showing all kinds of low temperature equipment.

Alliance & Surrey Wholesale, Ltd., 62, Great Russell Street, London.—A 50-page illustrated catalogue of electric fires.

General Electric Co., Ltd., Magnet House, Kingsway, London.—A pocket price list of "Osram" lamps.

J. A. Brook, Ltd., Lord Street, Huddersfield.—A folder giving details of the "Lox-all" lamp lock.

Metropolitan-Vickers Electrical Co., Ltd., 1, Kingsway, London, W.C.2.—A complete catalogue and price list (pp. 40) of "Cosmos" lamps.

Batwin Electric Motors, Ltd., 138, Southwark Street, London, S.E.1.—A card announcing reduced prices of the company's flexible shaft units.

Reason Mfg. Co., Ltd., Lewes Road, Brighton.—A leaflet dealing with type "DOA" m.d. indicators which have been reduced in price.

Jackson Electric Stove Co., Ltd., 143, Sloane Street, London, S.W.1.—The new season's catalogue of electric fires.

Cambridge Instrument Co., Ltd., 13, Grosvenor Place, London, S.W.1.—A leaflet dealing with indicating thermometers.

Batteries, Ltd., Hunt End Works, Redditch.—A comprehensive booklet dealing with "Nife" nickel cadmium alkaline accumulators, including discharge curves.

Weir Electrical Instrument Co., Ltd., Bradford-on-Avon, Wilts.—A catalogue of measuring instruments.

Herbert Morris, Ltd., Loughborough.—Details of the Morris electric chain block.

Goodman's Industries, Ltd., Lancelot Road, Wembley, Middx.—"The Attainment of an Ideal," an illustrated brochure giving particulars of the testing apparatus used in the development of this firm's loud speakers, with descriptions of actual products.

Foster Engineering Co., Ltd., Apex Works, South Wimbledon, London, S.W.19.—An illustrated booklet dealing with the design and manufacture of kiosks. The cover is in the shape of the front of a kiosk the "door" of which opens.

Receivers Released

Spence (Contracting), Ltd.—F. C. Pulley, of Finsbury Court, E.C., ceased to act as receiver on August 25th, 1938.

Lunar Electrical Co., Ltd.—A. J. Loarridge, of 12, Bedford Row, W.C.1, ceased to act as receiver and/or manager on September 6th, 1938.

Private Arrangement

Austin & Rivers, Ltd., High Street, Thorpe-le-Soken, Essex, wireless dealers, &c.—An informal meeting of creditors was held recently at the offices of Pike, Norfolk & Co., Mayfield Chambers, 93, Station Road, Clacton-on-Sea, when Mr. Churchman, of Churchmans, Ltd., was elected to the chair. A statement of affairs as at September 1st last disclosed ranking liabilities of £761. The net assets were £351, leaving a deficiency, as regarded the creditors of £410. In addition to the liabilities shown on the statement of affairs Mr. Rivers had advanced the company £600, but he did not intend to rank against the estate in respect of that loan. The debenture holders appointed Mr. W. J. Norfolk to act as receiver on August 9th last and he informed the meeting that an offer of £600 had been received for the assets of the company. It was unanimously decided that that offer should be accepted and steps taken for the voluntary liquidation of the company with Mr. F. E. Bendall, of Bendall, Poppleton & Appleby, 4, Charterhouse Square, London, E.C., as liquidator.

Bankruptcy Proceedings

W. G. Holt, 7, Shalford Road, South Yardley, Birmingham, electrical contractor.—The first meeting of creditors was held recently at the Official Receiver's Office, 159, Great Charles Street, Birmingham. The statement of affairs submitted showed gross liabilities of £413, of which £395 was expected to rank for dividend and there was a deficiency of £364. The case was left in the hands of the Official Receiver.

F. W. T. Layton and **R. E. Mills** (East Anglian Wireless Co.), Hamilton Road, Felixstowe (separate application of F. W. T. Layton).—Application for discharge to be heard on November 2nd at the Shire Hall, Ipswich.

A. W. Sadler, 115, Osmaston Road, Derby, radio engineer and dealer.—This debtor's statement of affairs disclosed ranking liabilities of £740 and assets of £118, leaving a deficiency of £622, at the first meeting of his creditors held on September 2nd at the Official Receiver's Office, 22, Regent Street, Park Row, Nottingham. The failure was attributed to losses arising through default of hirers under hire-purchase agreements effected through financiers, heavy cost of free service, and losses on sale of sets repossessed. The matter was left with the Official Receiver.

G. A. Glazebrook (Coventry Electrical & Wireless Supplies), radio engineer, 27a, Victoria Street, Coventry.—Application for discharge to be heard on October 25th at the County Hall, Coventry.

S. Holmes, electrical and wireless engineer, formerly residing and carrying on business at 41, High Street, South Normanton, now residing at 37, Downing Street, South Normanton, Derbyshire.—Trustee, Mr. A. J. Rogers, 22, Regent Street, Park Row, Nottingham, Official Receiver, released September 1st.

W. R. Paddon, radio dealer, Sea View Terrace, St. Ives, Cornwall, lately carrying on business at Chapel Street, St. Ives.—Trustee, Mr. G. C. Hancock, 12, Princes Street, Truro, Official Receiver, released September 6th.

W. Smith and **A. G. Smith** (W. Smith & Son), radio and electrical engineers, 23, Crescent Street, Weymouth.—**First and final** dividend of 4s. 6¾d. in the £, payable September 20th at 12, Rolleston Street, Salisbury.

J. W. Colleer, radio dealer, 3, Heybridge Street, Heybridge, Maldon.—Last day for receiving proofs for dividend September 28th. Trustee, Mr. J. L. Poland, 29, Russell Square, London, W.C.1.

A. G. Smith (separate estate), trading in partnership with W. Smith as W. Smith & Son, 23, Crescent Street, Weymouth, electrical and radio engineers.—Last day for receiving proofs for dividend September 27th. Trustee, Mr. H. T. Jones, 12, Rolleston Street, Salisbury, Official Receiver.

C. G. Merrison, radio dealer, 61B, Raleigh Street, Walsall.—Last day for receiving proofs for dividend September 28th. Trustee, Mr. R. K. Clark, 159, Great Charles Street, Birmingham, Official Receiver.

V. W. Henry, radio and electrical engineer, Acle, Norfolk.—Receiving order made September 15th on debtor's own petition.

Company Liquidations

Electrical Equipment (Hove), Ltd., 204, Portland Road, Hove.—The statutory meeting of creditors was held on September 15th at the offices of Mr. A. E. Orbell, accountant and auditor, 6/7, Old Steine, Brighton. A statement of affairs was presented showing liabilities of £742, of which £449 was due to the trade and £293 to the bankers. The net assets were £221, leaving a deficiency of £521. The shareholders had previously met and passed the usual resolution for the voluntary liquidation of the company and had nominated Mr. Orbell to act as liquidator, and after discussing the position the creditors decided to confirm this appointment. A committee was also appointed.

G. W. Cross & Co., Ltd.—Particulars of claims by September 30th to the liquidator, Mr. W. O. R. Read, Pinners Hall, Austin Friars, London, E.C.2.

Dasnieres, Ltd.—Winding up voluntarily. Liquidator, Mr. R. L. Latimer, 4B, Frederick's Place, Old Jewry, London, E.C.2.

George Skey & Co., Ltd.—Particulars of claims by September 31st to the liquidator, Mr. E. B. Green, 28, Lambeth High Street, London, S.E.1. This notice is purely formal, as all known liabilities of the company have been or will be paid in full.

Yeovil Electric Light & Power Co., Ltd.—Meeting, October 14th, at Thames House, Millbank, London, S.W.1, to receive an account of the winding-up by the liquidator, Mr. E. J. Harrison.

C. Gilbert & Co., Ltd.—Winding up voluntarily. Liquidator, Mr. G. Moulson, 22, Norfolk Row, Sheffield.

Dissolution of Partnership

Arden Manufacturing & Supply Co., radio and electrical dealers, 187, Stratford Road, Shirley, Warwickshire.—Messrs. W. H. Strong and R. B. Lowe have dissolved partnership. Mr. Strong will attend to debts and carry on the business.

Electricity Supply

Lighting, Domestic, Power

Axholme.—PUBLIC LIGHTING.—Street lighting schemes in several parts of the Isle of Axholme, Lincs, are being held up in consequence of the difficulty of getting owners of land to grant the necessary wayleaves. The owner of certain land at Epworth is willing to sell his land, but refuses to allow electricity lines to be constructed across it, and the R.D.C. Electricity Committee is considering approaching the Ministry of Transport for compulsory powers.

Bournemouth.—BETTER LIGHTING.—A five-year programme of improvements has been approved by the Lighting Committee, the cost per year being £5,500.

Brandon (Co. Durham).—SUPPLY ARRANGEMENTS.—The Urban District Council is to ask the North-Eastern E.S. Co., Ltd., to supply electricity to the Brandon and Meadowfield areas. Electricity was formerly available from Straker and Love, Ltd., who have reached an agreement with the supply company. Additional distribution cables will be required for the purpose.

Bradford.—MERCURY LAMPS CHOSEN.—Having inspected four experimental installations a special sub-committee has chosen colour-corrected mercury lamps for the lighting of Manningham Lane from Forster Square to the city boundary.

Chesterfield.—IMPROVED LIGHTING.—The accompanying photograph shows part of the 1½ miles of Chatsworth Road in which a new lighting installation has recently been provided. Formerly the thoroughfare was lighted by gas. The units have a 40-yd. spacing, with a 25-ft. mounting height and 4 ft. 6 in. projection brackets. The lanterns are of the "Wembley" type, equipped with 500-W tungsten filament lamps, and the lighting complies with the requirements of Class A trunk road lighting. Mr. D. H. Davies, the borough electrical engineer, informs us that electricity is supplied to the Street Lighting Committee at a net cost of 0.48d. per kWh.

New lighting at Chatsworth Road, Chesterfield

Erith.—SUCCESSFUL CAMPAIGN.—That a 20 per cent. increase in electricity sales was achieved during the past year is stated by the electrical engineer and manager, Mr. E. A. Logan, to be almost wholly due to more extensive use of electricity in the home. Last year a cooker hiring scheme was inaugurated at a mass demonstration, including an offer to install cookers free, all electricity used being charged at a "unit" rate of 1d. The success of the scheme is reflected in the fact that the Department received 2,000 applications for cookers on hire during the year, eight out of ten persons coming to reside in new property in the area choosing electricity for cooking. Nevertheless, the great increase in activity due to hiring has not had the effect of reducing the sales of apparatus for cash or on hire purchase. Another incentive to domestic development has been the introduction of a two-part tariff, and the formulation of plans for hiring water-heating apparatus should result in further headway. Had not the first three months of this year been unusually mild the total sales would undoubtedly have been substantially in excess of 29.2 million kWh and the expansion consequently greater. As the cables are large enough to cope with the increase in load, present distribution works are largely confined to the provision of additional sub-stations. On the bulk supply side, plans proceeded during the year for bringing a third cable to Erith.

Fleetwood.—STREET LIGHTING.—Nearly £2,000 is to be spent immediately by the Corporation on street lighting, the Ministry of Health having sanctioned a loan of £12,500 for improvements spread over ten years. Work will begin at once in four main thoroughfares, for which 500-W lamps will be used.

Grimsby.—SUB-STATIONS.—Sites at Tathwell and Donington-on-Bain are being purchased by the Electricity Committee upon which sub-station kiosks will be erected in connection with the extension of the Corporation electricity supply to Stenigot.

Ipswich.—MAINS AND SERVICES.—Sanction is being sought to borrow £60,000 for mains and services.

SUB-STATION.—The Electricity Committee is to erect a sub-station in Bramford Road at a cost of £355.

London.—ST. PANCRAS.—A report was recently submitted by the chief electrical engineer and manager giving his observations on the recommendations of the Technical Committee appointed by the Electricity Commissioners to consider the general question of fire risks, together with particulars of the additional precautions it is proposed to take to give effect thereto. The Electricity and Public Lighting Committee is satisfied that the proposals will provide all possible safeguards for the protection of the Council's power station in the event of fire. The Committee has also considered a full report from the chief electrical engineer regarding air raid precautions,

advocating certain measures for the protection of the Council's power station, the approximate total cost of which, excluding additional spares to be carried, is £1,045. The report is to be forwarded to the Central Electricity Board for its approval, and application will be made to the Board with a view to its bearing the cost of any measures which it approves. The chief electrical engineer in his report stresses the necessity for providing a secondary intercommunication system between the more important electric power stations in the London area, having regard to the importance of maintaining the supply in the event of damage occurring to one or other of the power stations. The Committee has accordingly given instructions for representations to be made to the appropriate authority that consideration should be given to a secondary intercommunication system, as suggested.

The Hampstead Borough Council has intimated to the St. Pancras Council its intention of including Haverstock Hill (a boundary road) among certain thoroughfares in which it is intended to improve the lighting to bring it into conformity with the Ministry of Transport recommendations for main traffic routes.

Five blocks of flats, all of which have "all-electric" domestic facilities, have recently been erected in York Rise, and are now connected to the supply. It is advisable that an alternative supply should be available in order to maintain the continuity of the supply in the event of the failure of the existing distributing main, and the provision of this at an estimated cost of £930 has been authorised.

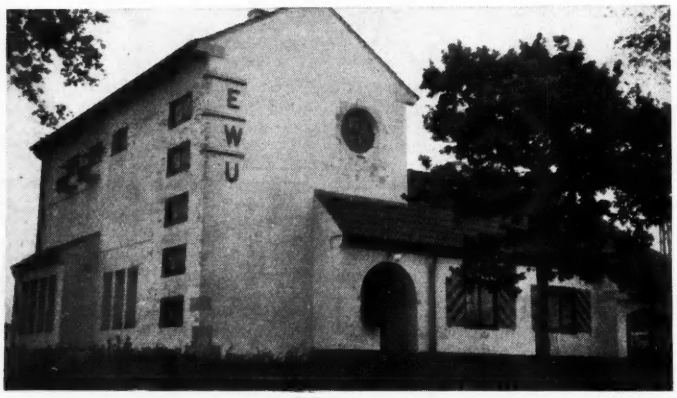
ISLINGTON.—The Electricity Committee is seeking sanction to borrow £30,000 for the extension of mains.

Portsoy.—ELECTRIC LIGHTING.—A seven years' agreement with the Grampian Electricity Supply Co. for street lighting has been signed by the Town Council.

Sunderland.—NEW SUB-STATIONS AND MAINS.—The Town Council is to erect three new sub-stations in Sussex Street, Prospect Row and near Queen Alexandra Road, at a cost of £15,245, including equipment. Application is being made for sanction to borrow £10,258 for sub-stations and equipment. A main is also to be laid at a cost of £463 to supply electricity to houses in Northumberland Street.

Sheffield.—PROPOSED SUB-STATION.—The Electricity Committee is to erect a sub-station in Worthing Road.

Stockport.—ILLUMINATIONS.—A special illuminations scheme



A well-designed German switching station

is contemplated as part of the programme for a Shopping Week in Stockport. The Chamber of Trade and the Corporation are jointly discussing the matter.

Rural Electricity Charges

Widespread Reductions

THE County of London Electric Supply Co., Ltd., and its associated companies announce a reduction from 1d. to ¾d. per kWh under their rural two-part tariffs in large rural areas in Kent, Essex, Surrey and Dorset, which will come into force in the approaching winter quarter.

These areas include almost the whole of rural Essex, embracing such small towns, far removed from industrial and congested centres, as Wickford, Maldon, Burnham-on-Crouch and Saffron Walden and their surrounding villages; in Kent, the villages of Ash, Chelsfield, Cudham, Darenth, Downe, Eynsford, Farningham, Fawkham, Hartley, Horton Kirby, Kingsdown, Knockholt, Longfield, Lullingstone, Ridley, Southfleet, Sutton-at-Hone, and many others, including the outlying districts adjacent to Chatham, Rochester and Deal, together with Romney Marsh and Elham Valley and in Dorset the areas around Blandford, Swanage and Wimborne.

In addition, the lighting flat rate is being reduced from 6d. to 5d. per kWh in Chislehurst, Foots Cray and a large number of villages in the West Kent area; and from 6d. to 5½d. in Sittingbourne, Milton, Swanscombe, Stone, and elsewhere. Reductions ranging from 6d. to 1s. 9d. per 100 W of installed lighting under the business two-part tariff fixed charge are also being made in many areas.

Swansea.—SPECIAL COMMITTEE'S DECISIONS.—Two important matters have been decided by the Special Committee appointed to investigate the working of the Tir John power station. One is the acceptance of the final report of Mr. John Bruce, the expert combustion engineer who was called in. At an interview with the Central Electricity Board when his report was discussed, it was stated that if the recommendations contained therein were adopted the cost of carrying out the works would be recognised by the Central Electricity Board as money properly expended for capital purposes within the terms of the Second Schedule of the Electricity Supply Act, 1926. The other matter is a settlement, after months of negotiation, with Messrs. Preece, Cardew and Rider, consultants engaged under an agreement of November 16th, 1931, when the Tir John scheme was decided upon.

LOANS.—Application is being made by the Electricity Committee for permission to borrow £150,000 for mains and services and £20,000 for meters.

Wellingborough.—SUB-STATION.—The Wellingborough Electric Supply Co. has purchased a site on the Croyland Road housing estate for a sub-station.

Overseas

Australia.—MELBOURNE.—The annual report of the electricity supply and hydraulic power undertaking, issued by the city electrical engineer, for the year ended December 31st, 1937, has just been received. The total revenue amounted to £740,239, the average charge being 1.308d. per kWh sold as compared with 1.381d. in the preceding year. This reduction was achieved in spite of increased operating costs. The domestic two-part tariff sales showed a notable increase of 53 per cent. over the previous year, the average number of kWh sold per consumer being 1,280 for the year. The total sales of electricity rose from 121.6 million kWh in 1936 to 129.5 million kWh in 1937, an increase of 6.5 per cent. Contracts were placed during the year for two turbo-alternator sets and two boilers.

Austria.—LOWER CHARGES.—The charges for supplies to large consumers have been reduced by 28 per cent. in an effort to encourage the wider use of electricity industrially. This has been made possible largely through the unification of all the Austrian electrical producers in the Alpenelektrowerke company, which now has complete control of production.

Germany.—MODERN SUPPLY METHODS.—In an interesting letter Mr. W. E. Jones, borough electrical engineer and manager at Basingstoke, informs us that he recently took the opportunity, while on holiday in Germany, of inspecting some of the sub-stations and overhead lines. These he found to be particularly efficient and up to date in every way, and in many respects superior to general construction in this country. Two points of particular interest are the use of oil-less air blast circuit-breakers for e.h.v. switchgear and the provision of a spare conductor on the e.h.v. overhead lines for use in the event of one phase breaking down.

Hungary.—SUPPLY SCHEMES.—The Minister of Industry has recently granted concessions to the Komitat of Heves electricity undertaking for affording a supply to the towns of Bukkszek, Ivad, Kisfuzes, Petervasara, Szalja and Terpes, and also to the Fejer Komitat undertaking, a subsidiary of the Hungarian General Coal Mining Co., Ltd., for supplying electricity to the towns of Baracs, Ivancsa, Pazmand, Soponya Tabajd and Zamoly.

Italy.—PRODUCTION OF ELECTRICITY.—According to *L'Energia Elettrica* 7,162.3 million kWh was generated by public utilities in the first half of this year as compared with 6,887.1 million kWh during the corresponding period of 1937, an increase of nearly 5 per cent. Hydro-electric plants generated 6,772.6 million kWh.

Rumania.—ACQUISITION OF ELECTRICITY UNDERTAKING.—It is reported from Bucharest that the terms of agreement have been settled between the municipality and the Hydrofina Co., of Brussels, regarding the taking over by the city of the Dobresti hydro-electric power stations, the 10-kV transmission line between Dobresti and Bucharest and the various plant and installations. The Hydrofina's subsidiary concern, known as the Jalomitza will, under the agreement, give up the various concessions it has hitherto held.

Sweden.—CONSTRUCTION PLANS.—In addition to Kr. 4,371,000 for the completion of the main transmission line from north to central Sweden, the Waterfalls Board has submitted an estimate of Kr. 20,200,000 to the Government for other works, states *Reuter's Trade Service* from Stockholm. An amount of Kr. 10,000,000 is required for work on a hydro-electric power station on the Stadsforsen rapids, Kr. 1,000,000 for a power station at Torpshammar, Kr. 4,000,000 for the Hojum station, Kr. 1,650,000 for a power station on the Kattstrupsforsen, Kr. 1,600,000 for a new set of generators and turbines at the Porjus station, Kr. 1,450,000 for enlarging the dam at the Suorva station, and Kr. 500,000 for regulating the level of lake Holmasjoen.

Traction

Aberdeen.—TRAMWAY PROGRESS.—An increase of £5,285 in the tramways revenue, bringing it to £157,852, is revealed by Mr. A. Smith, the general manager of the Corporation Transport Department, in his report for the year ended May 31st last. The working expenses were £124,147 (£117,132 in 1936-7) and the net profit was £4,915. The number of car miles run was 2,747,003 (passengers carried: 39,573,887), for which 6,570,847 kWh was used (2.392 kWh per car mile at 0.7d. per kWh). Traffic revenue was 13.718d. per car mile, while working expenses were 10.846d., the average fare paid per passenger being 0.95d.

Brighton.—VOLK'S RAILWAY.—The General Purposes Committee of the Corporation has recommended the continuation of the management of Volk's Railway by Magnus Volk, Ltd., on the basis of a yearly licence.

Leicester.—DISCONTINUANCE OF TRAM ROUTES.—The Coleman Road and King Richards Road tram routes are being closed down, the services being taken over by motor-buses.

London.—THE COLLISION ON THE DISTRICT RAILWAY.—In his report to the Ministry of Transport regarding the accident that occurred in May near the Charing Cross station of the London Passenger Transport Board, when one train ran into the rear of another at rest killing six people and injuring forty-five, Lt.-Col. E. Woodhouse states that the cause was a "false-clear" signal indicator. This resulted from a wrong connection made during a change over of track circuits from d.c. to a.c., which is being carried out in view of the adverse effects on d.c. apparatus of stray currents from the traction system under abnormal conditions. The District trains (unlike the deep-level tubes) are lighted from the traction system; they have no emergency battery and rely on an oil lamp for the tail for normal use. If the latter were kept for emergency only, it is held, the contrast in brightness between it and the ordinary electric lamp might cause it to be mistaken for a signal lamp (as it was in the present instance). The lighting of the trains involved was maintained for 28 min. until the power supply was cut off owing to a short circuit created by metal debris falling across the rails. Although the latter caused alarm to the passengers, the Inspector considers that the value of lighting in preventing panic justified the keeping alive of the traction system. The Board has decided to install lights in the tunnels of the District lines (as in the tubes) which will be automatically switched on when the power is interrupted. New cars now being delivered are equipped with a low-voltage system supplied from a motor-generator and battery; the latter will keep a proportion of the lights and also twin electric tail lamps going in emergency.

Southern Railway.—FURTHER ELECTRIFICATION PLANNED.—According to the *Financial Times*, the Southern Railway is understood to have under consideration a proposal to electrify the line between Tunbridge Wells and London *via* Oxted as a result of the abandonment, some time ago, of the scheme to electrify the main London-Tunbridge Wells-Hastings line. The section of line under consideration links up at East Croydon with the main London-Brighton line.

Communications

India.—"CARRIER" TELEPHONE SCHEMES.—Referring to the note under this heading in our issue of August 26th (p. 293), Mr. W. H. Ashley, M.I.E.E., chief engineer, Indian Radio & Cable Communications Co., Ltd., says that it is not correct that the first Indian carrier telephone system was installed in 1932, although it was the first employed by the Posts and Telegraphs Department. Actually, the beam wireless stations at Poona and Dhond were linked with Bombay by carrier in 1926.

Tunisia.—NEW TRANSMITTER.—First trial broadcasts from the new Government station, Poste Imperial de Djedeida-Tunisien, are being made this month. The station will probably work on a wavelength of 345 metres.

New South Wales Project

Report of the consulting engineers

THE extensive electrical development scheme for New South Wales, Australia, which is estimated to cost £23,000,000, has been taken a step further by the publication of the report of the consulting engineers, Messrs. Rendel, Palmer & Tritton, of London. The report runs to more than 200 pages, the proposals in which may be divided into those relating to electricity supply and those on the electrification of the four main railway lines radiating from Sydney to Newcastle, Lithgow, Goulburn and Nowra.

An outline of the recommendations relating to the generation of electricity given in the *Electrical and Radio Trader* (Australia) is divided into four areas, as follows:—

Sydney and District.—It is considered by the consultants more economical to extend existing power stations in Sydney than to establish a new station near the coalfields. Extensions to Bunnerong power station of 100,000 kW and to White Bay station of 150,000 kW, which would cost £2,180,000 and £3,160,000, respectively, are therefore recommended. The alternative proposals of hydro-electric schemes on the Shoalhaven and Snowy rivers were investigated and it was decided by the consultants that the former was not an economic source of power, but that the latter possessed all the elements of a successful hydro-electric power undertaking. The Snowy River scheme is recommended as an auxiliary to the steam plants. It is estimated that the capital cost would be £10,600,000, for an installed capacity of 220,000 kW, and it is recommended that the scheme should be proceeded with so as to be ready for initial operation in 1944.

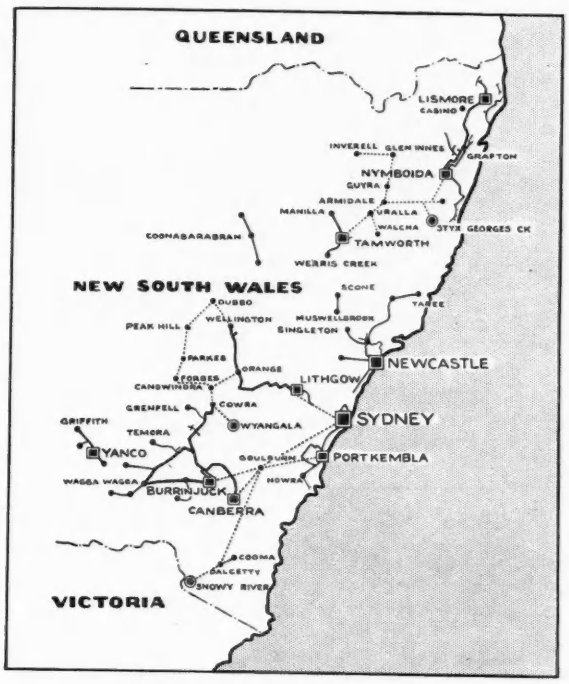
Newcastle and District.—It is estimated that additional plant of 30,000 kW will be required in the Newcastle district by 1947. This includes the increased loading required by the northern, western and southern areas, now supplied with power in bulk by the Railway Department's Zarra Street power station.

South Western Area.—This area includes that portion of the State supplied by the Port Kembla, Burrinjuck and Lithgow stations and it is proposed that these stations should be interconnected. In order to interconnect the Burrinjuck and Lithgow systems it is proposed that a hydro-electric station should be constructed at Wyangala, with transmission lines interconnecting the stations and linking up with several towns in the district.

This south western system would be connected with Sydney by the three 66-kV railway transmission lines radiating to Port Kembla, Goulburn, and Lithgow.

North Eastern Area.—It is proposed that a north eastern area (except the Tweed Shire) should be established by extending the generating plant at Lismore by the addition of two 2,500 kW steam generating sets; by the construction of a hydro-electric plant of 8,000-kW capacity on Styx-Georges Creek, and by linking up with Tamworth and Nymboida with a 66 kV transmission line. Extensions to serve the New England Tableland towns of Armidale, Guyra, Glen Innes and Inverell are also proposed.

The consultants recommend the creation of a central elec-



The proposed electrical network in New South Wales (Black squares indicate steam stations and circles hydro-electric stations)

tricity authority, organised as a commercial undertaking, responsible to Parliament, which should supersede the existing Electricity Advisory Committee. The central body should develop, generate, transmit and sell electricity in bulk (but not retail) while the distribution to individual consumers should be left to local authorities with their existing organisations.

Personal and Social

Information regarding new appointments and other matters of interest for this page are welcomed

IN the spring of this year **Mr. R. Gretton Lowe** relinquished his appointment as marketing officer to the Brush Electrical Engineering Co., Ltd., to become general manager of Whitehead Switchgear, Ltd., of Cardiff. He has now joined the board of Whitehead Switchgear and Inventions, Ltd., a new company recently formed to take over the interests of Whitehead Switchgear, Ltd., and Whitehead Inventions, Ltd. A new works is approaching completion at Treforest, near Pontypridd, Glamorgan, laid out for the production of h.v. and l.v. switchgear under Whitehead patents, and Mr. Gretton Lowe will be responsible for its management. He is an A.M.I.E.E., and a member of the Institution of Engineering Inspection.

Mr. A. E. Knights, former borough electrical engineer to the Bury St. Edmunds Corporation, who has been appointed resident engineer at Bury St. Edmunds under the East Anglian Electric Supply Co., which has purchased the borough electricity undertaking, was presented with an inscribed silver salver at a recent meeting of the Town Council. A resolution was also passed recording the Council's appreciation for his services.

Mr. A. E. Knights [*Lafayette*

Mr. W. A. A. French, a director of the Leicester Electrical Engineering Co., Ltd., was married recently to Miss Violet Eva Luker. His father, Mr. W. H. French, is managing director of the company.

It is announced by E. K. Cole, Ltd., manufacturers of "Thermovent" electrical convectors, that **Mr. H. Wintle,** A.M.I.E.E., of 115, Kent House Road, Beckenham, Kent, has been appointed technical sales engineer for London and the Home Counties, to co-operate with the existing "Thermovent" representatives. Mr. Wintle was previously with Elexcel, Ltd.

Mr. C. Sharp, director of Venner Time Switches, Ltd., and past-president of the Rotary Club of New Malden, has been elected vice-chairman of District 14 (Surrey and West Sussex).

Mr. K. E. Holmblad has been appointed chief engineer of the Danish Post Office, in succession to the late Mr. Kay Christiansen, who died a year ago. In a recent broadcast Mr. Holmblad gave as a major point of his programme the entire automatisation of all telephones in Denmark. The scheme is rather an ambitious one, being estimated to cost the country from 150 to 200 million kroner.

Sir Tom Callender is to attend the Erith Charter Day luncheon on September 28th. To celebrate the granting of the charter he has given the town a gold mace. **Councillor G. C. Humphreys,** the charter mayor, has been chairman of the Electricity Committee for many years.

Mr. C. H. Bulman, deputy city electrical engineer, Cardiff, was married on September 17th at Cockington Church, Torquay, to Miss Vera Florence Sparks.

Mr. F. S. Smith, manager of the Electrical Department of Lighting Trades, Ltd., showing the Mayor of Holborn some of the fittings at the opening of the company's new showroom (See page 427)

Mr. A. Letts, chief assistant electrical engineer with Lincoln Corporation Electricity Department, retired on September 15th after thirty-eight years' service with the department. He was with the Northampton Electric Supply Co. from 1895 to 1900, when he joined the Lincoln undertaking, which he has seen increase its generating capacity from 560 kW to 17,000 kW.

At Coventry, where the Telephone and Radio Works of the General Electric Co., Ltd., are situated, a large area of the estate on which the factory is built is occupied by the sports ground. A new pavilion in modern style was recently completed at a cost of nearly £9,000, and was officially opened on September 16th, by **Mrs. M. J. Railing.** She cut a tape across two columns on the colonnaded terrace and then laid a commemoration stone in the entrance hall. Mrs. Railing was accompanied by **Mr. Railing,** vice-chairman and joint managing director of the company, who addressed a large assembly of members of the Works Social Club by means of loudspeakers. Mr. Railing said that a building of such size and appointments, and the grounds in which it stood, were possible only in a large business, and that in turn had been made possible, at least as far as the Coventry Works were concerned, only by the service and loyalty to the company unfailingly given by those present. He mentioned the growth of the works from 1,400 employés when the move was made from Manchester to Coventry in 1921, up to the present-day figure of nearly 7,000. Sir William Noble (director) also spoke.

Mr. and Mrs. M. J. Railing at the opening of the new G.E.C. sports pavilion at Coventry

Obituary

Mr. D. C. F. van Eendenburg.—It is with regret that we have to announce the death of Mr. D. C. F. van Eendenburg, managing director of Philips Lamps, Ltd., as the result of a motor accident on Saturday evening last. Mr. van Eendenburg, who was fifty-three, had been managing director of Philips Lamps, Ltd., since its formation in January, 1925. He joined the Philips organisation in Holland in 1909. After extensive travelling, he represented the company in Russia, and subsequently he opened up the Philips organisation in Scandinavia. He had travelled widely in Central Europe and the Balkan States, and his business activities also took him as far afield as Egypt, India, the Dutch East Indies, China and Japan. He was an accomplished linguist. In 1934 Mr. van Eendenburg was invested with the Order of Knight of the House of Orange-Nassau.

The late Mr. D. C. F. van Eendenburg

Herr C. Krecke.—One of the most prominent men in the German power industry, Herr Carl Krecke, has died in Berlin, aged fifty-four. Herr Krecke was a member of the board of the Berlin Power & Light Co., leader of the Reichs Committee for the Development of Power, and once lived in London as representative of the A.E.G. He represented Germany at the World Power Conference in Washington in 1936. In recent years his energies had been devoted to the development of power in Germany in accordance with Field-Marshal Goering's four-year plan for self-sufficiency, but he was also active in many other directions, and was a member of the Berlin Cham-

ber of Industry and Commerce and the German Railways Administrative Board. Born at Bad Sulzullen, Herr Krecke went to the United States soon after completing his studies. For two years he worked in various American concerns, then came to Britain as representative of the A.E.G. Afterwards he held positions with the A.E.G. in Cologne and as director of the company's Hennigsdorf factories. He was later director of the Bergmann-Elektrizitaets-Werke and the Maffei-Schwartzkopff Werke.

Mr. W. R. Barclay.—We regret to announce the death of Mr. William R. Barclay, who died at his home in Birmingham on September 16th at the age of sixty-three. Mr. Barclay, who was one of the leading metallurgists in this country, was educated privately, and attended the Sheffield Technical College (now the University of Sheffield), where later he became a part-time lecturer. He was an Honours Silver Medallist in electro-metallurgy at the City and Guilds of London Institute, and became an A.M.I.E.E. in 1900. During the years 1893-1912 he successively acted as assistant to the works manager of Mappin Bros., Sheffield, and the works manager and technical adviser to Joseph Rodgers & Sons. From 1910-1919 he was lecturer in electro-metallurgy at Sheffield University, whilst from 1912-1928 he was joint examiner in this subject to the City and Guilds of London. During the war Mr. Barclay became chief metallurgist and assistant director in the Non-Ferrous Rolled Metal Section and technical director of the Electro-Metallurgical Committee of the Ministry of Munitions. He was awarded the O.B.E. for his services. In 1928 Mr. Barclay became managing director of Henry Wiggin & Co., Ltd., and in 1931 he was appointed consulting metallurgist to the Mond Nickel Co., Ltd. During his association with the Mond Nickel Co., Ltd., Mr. Barclay was largely instrumental in initiating the company's research and development organisation. He was also associated with the Copper Development Association from its inception. Mr. Barclay was president of the Institute of Metals in 1936 and 1937.

Mr. Arthur E. Barfield, whose death occurred on September 15th at his home at Chalfont St. Giles, Bucks, was one of the founders of Wild-Barfield Electric Furnaces, Ltd., chairman of that company since its incorporation in 1917, and a director of its associated company, G.W.B. Electric Furnaces, Ltd. Mr. Barfield, who was seventy-four years of age, was also senior partner of Barfield & Barfield, of Broad Street House, London, E.C.2.

The late Mr. A. E. Barfield

Mr. H. I. Brackenbury.—Mr. Hereward I. Brackenbury, of Tweedhill, Berwick, Northumberland, who recently retired from the board of R. and W. Hawthorn Leslie & Co., Ltd., died on September 17th at the age of sixty-seven. Mr. Brackenbury was apprenticed to engineering at the Elswick Works, Scotswood, Newcastle, in 1886. He had served on the boards of C. A. Parsons & Co., Ltd., Armstrong Siddeley Motors, Ltd., and the Newcastle & District Electric Lighting Co., Ltd. In 1918 he was awarded the C.B.E.

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

H. McCarthy, Ltd.—Private company. Registered September 12th. Capital, £100. Objects: To carry on the business of manufacturers of, agents for and dealers in all kinds of radio, television, amplifying, transmitting and receiving apparatus, &c. The directors are: Mrs. V. E. Hadley, 233, Argyle Road, W. Ealing, W., J. A. E. Lancaster, 34, Eton Avenue, Wembley, and H. J. Hall, The Forge, Chigwell Row, Essex. Secretary: J. A. E. Lancaster. Registered office: 92, Queensway, Bayswater, W.2.

Wright & Lloyd, Ltd.—Private company. Registered September 12th. Capital, £1,000. Objects: To carry on the business of manufacturers and repairers of, agents for and dealers in electrical apparatus, goods and supplies of all kinds, mechanical implements, wireless apparatus, &c. The permanent directors are: A. Wright, 28, Lingfield Avenue, Kingston, Surrey, and F. D. Lloyd, 18, Chatsworth Road, East Croydon.

S. & F. Tools, Ltd.—Private company. Registered September 13th. Capital, £2,000. Objects: To carry on the business of mechanical, general, electrical, radio, marine, civil, consulting and constructional engineers and contractors, manufacturers of and dealers in machinery, forgings, tools, dynamos, motors, magnetos, batteries, hardware and engineering equipment, &c. The first directors are: H. Shephard, 8, Crackley Crescent, Kenilworth, Warwickshire, and M. B. Fitzgerald, 122, Cliffe Hill, Warwick. Solicitors: D. D. Longmore & Co., 8, The Quadrant, Coventry.

Neon Signs (Sheffield), Ltd.—Private company. Registered September 13th. Capital, £500. Objects: To acquire the business of an electrical engineer carried on by R. Vernon at 23, Button Lane, Sheffield. The subscribers are: R. Vernon and Mrs. E. Vernon, both of Swiss Chalet, Aston, near Sheffield. R. Vernon is permanent managing director. Solicitor: J. P. Crehan, Rotherham.

Northbourne Electrical Co., Ltd.—Private company. Registered September 12th. Capital, £1,000. Objects: To carry on the business of dealers in wireless, radio and television apparatus, gramophones, records and cycles, general and electrical engineers, &c. The directors are: R. H. Mountain, 25, Barrie Road, Moordown, Bournemouth, and C. E. Mountain, "Mowbray," Kinson Park Road, Northbourne, Bournemouth. Registered office: Corner of Wimborne Road and Northbourne Avenue, Ensbury, Bournemouth.

Watford Metal Pressings, Ltd.—Private company. Registered September 14th. Capital, £100. Objects: To carry on the business of manufacturers and designers of and dealers in electric lamp caps, manufacturers of metal and other fittings of all kinds, button manufacturers, chain makers, screw manufacturers, &c. The directors are: V. H. McGrattan, 135, Rickmansworth Road, Watford, and five others. Solicitors: Sedgwick Turner, Sworder & Wilson, Watford.

D'Arcy & Gould, Ltd.—Private company. Registered September 12th. Capital, £1,050. Objects: To acquire an agency for the sale of refrigerators, &c. The first directors are: G. P. D'Arcy, 23, Wheats Avenue, Harborne, Birmingham, and F. W. Gould, Bradley Street, Tipton, Staffs. Solicitors: Edge and Ellison, 5, Waterloo Street, Birmingham.

Perkins (Leyton), Ltd.—Private company. Registered September 12th. Capital, £1,000. Objects: To carry on the business of dealers in radio, electrical, scientific and telephone apparatus and installations, dealers in motor vehicles, motor and other cycles, &c. The directors are: J. Perkins, 45, Suffolk Road, Newbury Park, Essex, and S. H. E. Perkins and Mrs. E. Perkins, both of 439, High Road, Leyton, E.10. Secretary: S. Perkins. Registered office: 439, High Road, Leyton, E.10.

Latobi Ray (London), Ltd.—Private company. Registered September 15th. Capital, £100. Objects: To acquire patents connected with insecticide by means of radiology, chemistry, electricity or otherwise, and to carry on the business of manufacturers of and dealers in apparatus for insecticide, radiology, electricity, electrotherapy, bacteriology, surgery, &c. The first directors are: H. Attari, 2B, Farm Street, Hill Street, W.1, and W. R. Sharp, Devonshire House, Strawberry Vale, Twickenham, Middlesex. Registered office: 19, Berkeley Street, W.1.

Elmbridge Electric, Ltd.—Private company. Registered September 15th. Capital, £600. Objects: To acquire the business of electrical engineers and contractors carried on by E. C. A. Davey and O. M. Davey, at 3, Prince Albert Square, Earlswood, Surrey, as Davey Bros. and E. C. A. Davey. The permanent directors are: Mrs. A. Brett, 166, Hook Rise, Surbiton, Surrey, E. C. A. Davey, 3, Prince Albert Square, Earlswood, Surrey, and O. M. Davey, 168, Hook Rise, Surbiton. Registered office: High Holborn House, High Holborn, W.C.1.

Droylsden Wire Works, Ltd.—Private company. Registered September 15th. Capital, £100. Objects: To carry on the business of wire drawers, weavers and workers, metal founders and workers, alloy makers, metal and alloy refiners, machinists, mechanical, electrical and general engineers, &c. The first directors are: S. W. Joynson, 3, Lindley Avenue, Latchford, near Warrington, and F. Woodward, 14, Ripley Street, Warrington. Registered office: 130, Gaskill Street, Newton Heath, Manchester, 10.

W. Patrick & Son, Ltd.—Private company. Registered September 17th. Capital, £6,000. Objects: To carry on business as manufacturers, constructors and designers of and dealers in refrigerators, &c. The directors are: W. J. Patrick, 93, Montalt Road, Woodford Green, Essex, and E. W. Patrick, 13, Crealock Grove, Woodford Green. Secretary: D. Israel. Registered office: 1/4, Cambridge Passage, Well Street, E.9.

Hewart & Cairns, Ltd.—Private company. Registered September 17th. Capital, £500. Objects: To carry on the business of wireless contractors, &c. The directors are: F. Cairns, 7, Prestfield Road, Whitefield, Lancs, and H. Hewart, 163, Butterstile Lane, Prestwich, Lancs. Secretary: F. Cairns. Registered office: 137, Great Clowes Street, Salford, 7.

A. Sherwood & Co. (Engineers), Ltd.—Private company. Registered September 17th. Capital, £100. Objects: To acquire the business of an engineer surveyor, carried on by A. Sherwood at 37, Burrill Avenue, Cosham, Hants; and to carry on the business of motor claims assessors, inspecting and testing engineers of electrical and mechanical plant and machinery, land and marine steam and heavy oil engines, air compressors, &c. The directors are: A. Sherwood and M. Sherwood, both of "Cresta," Burrill Avenue, Cosham, Hants. Registered office: 37, Burrill Avenue, Cosham, Hants.

Northern Flexible Metallic Tubing Co., Ltd.—Private company. Registered September 1st. Capital, £6,000. Objects: To acquire the business of a manufacturer of flexible metal tubing carried on by N. Crowther at Bradford. The first directors are: N. Crowther, 39/41, Grattan Road, Bradford, C. D. Birks and N. A. Birks, both of 90-91, Blackfriars Road, S.E.1. Registered office: Grattan Road Works, Bradford.

Radio (Car Equipment), Ltd.—Private company. Registered August 31st. Capital, £500. Objects: To carry on the business of manufacturers of and dealers in car wireless sets, radio sets and valves, &c. The directors are: G. T. McNeill, 122, Empire Court, Wembley Park, Middlesex, and L. A. E. Parkes, 4, Sudbury Crescent, Wembley. Registered office: Midland Bank Chambers, 126, Wembley Park Drive, Wembley.

J. D. Wireless (Liverpool), Ltd.—Private company. Registered August 25th. Capital, £200. Objects: To carry on the business of wholesale or retail wireless distributors, manufacturers of all types of wireless and electrical equipment, includ-

ing talking pictures and television equipment, &c. The directors are: H. Dumbell, 21, Stanley Road, Huyton, and R. F. Packwood, 6, Marion Road, Liverpool. Secretary: Reginald F. Packwood. Registered office: 41, Castle Street, Liverpool, 2.

Barber, Green, Ltd.—Private company. Registered August 26th. Capital, £500. Objects: To carry on the business of manufacturers and merchants to the building, electrical, heating, plumbing and engineering trades, &c. The permanent directors are: E. F. Barber, 42, Cotton Road, Potters Bar, and E. G. Green, 20, Forty Close, Wembley, Middlesex. Registered office: 42, Cotton Road, Potters Bar, Middlesex.

Aslay, Ltd.—Private company. Registered September 17th. Capital, £1,000. Objects: To carry on the business of dealers in and manufacturers of electric, hand and lathe grinders, drilling machines and grinding and milling machines, mechanical, hydraulic, electrical and motor engineers, &c. The subscribers are: Frederick H. Harman, 39, Cantley Gardens, Ilford, solicitor's clerk; Leonard E. J. Patterson, 6, Haycroft Road, Brixton Hill, S.W.2, solicitor's cashier. Solicitor: A. M. Oppenheimer, 31, Queen Victoria Street, E.C.4.

Returns of Electrical Companies

H. A. Lamb & Sons, Ltd.—Capital, £1,000 in £1 shares. Return dated June 8th, 1937 (filed May 5th, 1938). All shares taken up. £615 paid, £385 considered as paid. Mortgages and charges nil.

D.P. Battery Co., Ltd.—Capital, £100,000 in 100,000 shares of £1 each. Return dated April 1st, 1938. All shares taken up. £28,000 paid, £72,000 considered as paid. Mortages and charges nil.

Submarine Signal Co. (London), Ltd.—Capital, £1,000 in £1 shares. Return dated April 13th, 1938. All shares taken up. £1,000 paid. Mortgages and charges nil.

Bideford & District Electric Supply Co., Ltd.—Capital, £140,000 in £1 shares. Return dated May 27th, 1938. All shares taken up. £128,400 paid, £11,600 considered as paid. Mortgages and charges: £5,280 9s. 7d. (bank overdraft).

Birkdale District Electric Supply Co., Ltd.—Capital, £55,000 in £5 shares. Return dated May 27th, 1938. 10,200 shares taken up. £51,000 paid. Mortgages and charges: £25,553 15s. 4d.

A. Berkeley, Ltd.—Capital, £10,000 in £1 shares. Return dated May 17th, 1938. 7,800 shares taken up. £7,800 paid. Mortgages and charges nil.

Birmingham Home Office Telephone Co., Ltd.—Capital, £1,000 in £1 shares. Return dated May 14th, 1938. 1,000 shares taken up. £1,000 paid. Mortgages and charges nil.

Eastern Extension Australasia & China Telegraph Co., Ltd.—Capital, £4,000,000 in £1 ordinary stock. Return dated May 31st, 1938. All stock taken up. £4,000,000 paid. Mortgages and charges: £752,400.

Henley's (South Africa) Telegraph Works Co., Ltd.—Capital, £2,000 in £1 shares. Return dated May 6th, 1938. All shares taken up. £2,000 paid. Mortgages and charges nil.

Beaconectric, Ltd.—Capital, £5,000 in 4,000 ordinary and 1,000 preference shares of £1. Return dated June 10th, 1938. 3,434 ordinary and 384 preference shares taken up. £1,618 paid, £2,200 considered as paid. Mortgages and charges nil.

Sadi Engineering Co., Ltd.—Debenture charged on factory No. 92, Standard Road, Chase Estate, Acton, N.W., and the company's undertaking and other property, present and future, including uncalled capital, dated August 25th, 1938, to secure all moneys due or to become due from the company to Westminster Bank, Ltd.

Automatic Coil Winder & Electrical Equipment Co., Ltd.—Satisfaction in full on July 12th, 1938, of debenture dated June 29th, 1934, and registered July 16th, 1934, securing £5,000. (Notice filed September 7th, 1938.)

Orel Micro Electric, Ltd.—Debenture, charged on the company's undertaking and property, present and future, including uncalled capital, dated September 2nd, 1938, to secure all moneys due and to become due from the company to Investment Securities Company, Ltd., 147, Queen Victoria Street, E.C.

Totalfinance, Ltd.—Debenture charged on the company's undertaking and property, including uncalled capital and an assignment of the benefit of certain agreements and all monies payable thereunder, dated September 6th, 1938, to secure £1,500. Holders: United Dominions Trust, Ltd., Regis House, King William Street, E.C.4.

F. W. Blanshard, Ltd.—Debenture, charged on the company's undertaking and property, present and future, including uncalled capital, dated August 29th, 1938, to secure £3,500. Holder: C. H. Smith, 18, Church Street, Twickenham.

General Lighting Equipment Co., Ltd.—The nominal capital has been increased by the addition of £800 beyond the registered capital of £200. The additional capital is divided into 3,200 6 per cent. "A" cumulative participating preference shares of 5s. each.

City Notes

J. & F. Stone Lighting & Radio, Ltd.—Presiding at the annual meeting held on September 19th Mr. N. W. Wild (chairman) said that the turnover was substantially maintained and the net profit during a year when so many other undertakings of a similar kind had had to report less satisfactory results bore a fair comparison with that of the previous year. There could be no doubt that the prospects for the progressive manufacturer and the enterprising retailer could be regarded with some optimism. Their own experience had shown that the ever-changing designs, the continuous improvements in manufacture and the standard of service set up at their branches continued to bring recurring business with their old customers and to make new customers. It was now evident that television would become a further important feature of their business, although they felt that the retail prices were not yet within the reach of the general public. They had started the new financial year satisfactorily, and so far their turnover had shown an upward trend.

The Harland Engineering Co., Ltd.—The *Financial Times* reports that about 5 per cent. of each class of share will have to be taken up by the underwriters. The offer comprised 140,554 10s. 6 per cent. cumulative preference shares at par and 340,370 5s. ordinary shares at par. Lists were opened at 9 a.m. on September 15th and closed five minutes later.

Craven Brothers (Manchester), Ltd., are paying an interim dividend of 7½ per cent. (against 5 per cent). The directors state that the volume of orders now on hand and in sight ensures the company being kept fully employed for the next two and a half years.

The Hankow Light & Power Co. reports a profit for the year ended March 31st of £10,158, as compared with £12,402 in the preceding year, to which is added £16,158 brought forward. The final ordinary dividend is 2½ per cent., making 10½ per cent. for the year (against 13 per cent.), and a dividend of 5s. per share is paid on the deferred shares (against 10s.), leaving £19,116 to be carried forward. The sales of electricity increased from 4,173,855 to 5,310,276 kWh.

Trafford Park Estates, Ltd., reports that £100,000 of the mortgage debenture stock was redeemed or purchased and cancelled during the year ended June 30th last. The surplus for the year before providing for N.D.C. and income tax was £58,289. After meeting these and other charges and adding £46,568 brought forward and profit on redemption of chief rents and realisation of investments, it is proposed to pay a final dividend of 4 per cent. (making 7 per cent. for the year) and a bonus of 1 per cent. A balance of £49,669 is carried forward.

The Electrolytic Zinc Co. of Australasia reports that the net profit for the year ended June 30th, after providing £145,000 for amortisation and depreciation and £125,417 for taxation, was £459,524. For the previous year the net profit was £536,613.

Richard Johnson, Clapham & Morris, Ltd., are paying a final ordinary dividend of 11¼ per cent., making 15 per cent. for the year (same).

The Lancashire Electric Light & Power Co. has declared an interim dividend of 2½ per cent., less tax (unchanged).

The Midland Electric Corporation for Power Distribution, Ltd., is maintaining its interim dividend at 3 per cent.

Brilliant Signs, Ltd., is again paying an interim dividend of 4 per cent. on the ordinary capital.

The Automatic Telephone & Electric Co., Ltd., has declared an interim ordinary dividend of 3 per cent., less tax (same).

British Insulated Cables, Ltd., is maintaining its interim dividend at 5 per cent., less tax.

The Midland Counties Electric Supply Co., Ltd., has announced an interim dividend of 2½ per cent. (same).

The West London and Provincial Electric & General Trust is again paying an interim dividend of 2½ per cent., less tax.

The Lancashire United Transport & Power Co., Ltd., is paying an interim dividend of 4 per cent. (against 2½ per cent.).

The Marconi International Marine Communication Co., Ltd., announces an interim dividend of 2½ per cent., less tax.

A. Reyrolle & Co., Ltd., have announced an interim dividend of 5 per cent., less tax (same).

The Watford Electric & Manufacturing Co., Ltd., has declared an interim dividend of 5 per cent., less tax (unchanged).

Vickers, Ltd., has announced an interim dividend of 4 per cent., less tax at 5s. 6d., on the ordinary stock.

The British Aluminium Co., Ltd., is maintaining its interim ordinary dividend at 4 per cent., less tax. This is payable on the capital as increased to £3,000,000 by the issue of 1,000,000 £1 shares in October last.

Imperial Chemical Industries, Ltd., is again paying an interim ordinary dividend of 3 per cent., actual.

Cable & Wireless, Ltd., announces an interim dividend at the rate of 1½ per cent., less tax (same).

Cable & Wireless (Holding), Ltd., is paying a dividend of 2¾ per cent. on the preference stock, less tax at 5s. 5d. (unchanged).

Stocks and Shares

TUESDAY EVENING.

STOCK EXCHANGE markets are dominated by the character of the Continental news. This has varied from day to day. Mr. Chamberlain's dramatic and courageous decision, to meet Herr Hitler, brought about a violent change for the better in prices which previously had shown acute weakness. The rally held its ground tolerably well; and, on the Tuesday in this week, when the Czechs were said to be on the point of agreeing to Germany's terms, markets as a whole went better on the assumption that the peace would not be broken. There continues to be, however, a feeling of uneasiness in the air. Many clients have frankly announced their intention of refraining from making purchases of stocks and shares, however cheap the prices may look, until a more settled state of affairs develops, and people are better able to see their way. When their Stock Exchange broker gently hints that this delay may result in higher prices having to be given, the invariable reply is that such a risk is both recognised and accepted. The purely gilt-edged stocks show falls ranging from 10s. to 3½. The ordinary shares of Home electricity supply companies are mostly down from 1s. to 1s. 6d.

The paralysis which a crisis, such as that of the last month, can lay upon ordinary business activity, is exemplified by

the August Cable & Wireless index figure. This is the lowest recorded for eight years. The figure has got down to 60.2, which reduces the average for the first eight months of the present year to 68.3, this being 12 points below the index figure for the first eight months of 1937. Lord Pender, the governor of the company, warned stockholders last May, at the annual meeting, that there might be some decrease in the Cable & Wireless revenue during the early stages of the scheme under which lower charges were established for Empire messages. It can be said with safety, however, that no one expected such a falling off as that shown by the figures for August.

Communication Stocks

On the same day that this was published, it happened, by a fortunate coincidence, that the directors of Cable & Wireless Holding Company met and declared the usual half-yearly dividends on the preference and ordinary stocks. This was taken as an indication that the 5½ per cent. preference stock in the Cable & Wireless operating company—whose issues are quoted in our list—will duly receive its proper rate. On this point a little doubt had previously been felt. From being 86 the price of the preference recovered to 88⅜; the ordinary, after touching 39, rallied to 40. Globe ordinary shares are unchanged at 30s.; the preference at 26s. 3d. are down $\frac{1}{16}$ in sympathy with investment stocks generally.

Brush Developments

Comment on the agreement by which Brush Electrical Engineering is to take over the Petter oil-engine business has made generally good reading for the stockholders concerned. As the outcome of last week's announcement, there had been a substantial rise in the price of Petters shares, to 45s., while Brush remained at 5s. 3d. Subsequently the weight of general anxiety depressed Brush to 5s. and Petters to 42s. 6d. Brush stock is quoted now in 5s. units as a result of last May's capital reorganisation, when the ordinary capital was written down by 75 per cent. The next step is the issue, originally intended for this month, of 150,000 £1 ordinary shares and £100,000 5¼ per cent. debenture stock. With the prospect of the finances being straightened out and replenished, and with the expectation of benefits to come from the new merger, the dividend chances are regarded in a brighter light. Nothing has been paid on the ordinary stock since the 5 per cent. dividend of 1930.

Lancashire United Transport and Power

Although scant attention can be spared at the moment for company news, the announcement of an increase in the interim dividend on Lancashire United Transport ordinary capital attracted sufficient notice to cause a sixpenny rise in the price of the shares. The payment of 4 per cent. goes against 2½ per cent. at the half-way stage last year, when the total distribution was made up to 10 per cent. There is no knowing, of course, whether the latest declaration augurs an increase in the final payment: but the company's interests are evidently expanding well, and the expectation of about 12 per cent. for the whole of this year is considered not unreasonably optimistic. On the old basis of 10 per cent., the shares at 32s. 6d. ex-dividend yield over 6 per cent. After being out of the dividend list for many years the shares received 5 per cent. in 1934 and a rise of 1½ per cent. in each of the past three years. Activities of the company combine the running of a fleet of electric trolley vehicles with the operation of a generating station.

Interim Dividends

British Insulated Cables have declared the regular 5 per cent. interim dividend. Over the past decade the dividend record is nearly identical with that of Callender's Cables, which company made a similar declaration in the previous week. That is to say, the 5 per cent. interims have been followed uninterruptedly by finals of 10 per cent., with 5 per cent. cash bonuses tacked on in the last year or two. In the case of British Insulated, these bonuses have been added in each of the past three years. The difference in the two records is that British Insulated gave a 20 per cent. share bonus in 1936, and proceeded to maintain the dividend rate on the larger capital. British Insulated shares pay slightly over, and Callender's rather under, 4½ per cent. on the money. The difference may be due in part to the coming partnership between Callender's and Crompton Parkinson.

Automatic Telephone and Electric shares are steady at £2, ex-dividend, on the repetition of last year's 3 per cent. interim payment. That an increase in the total distribution over the previous 10 per cent. would come as no surprise is indicated by the yield of 5 per cent., which ranks in these times as a fairly modest return from industrial ordinary shares.

Midland Counties Electric shares have a place among the soundest and most progressive in the electricity supply group, and here also there are hopes of better things to come in future dividends. The interim of 2½ per cent. is the same as previously. Marconi Marine has acted similarly, but the shares are 1/16 down, at 23s. 9d.

Revo Electric Company, Ltd., has received an official quotation for its 735,000 ordinary shares of 10s. each in the London Stock Exchange Official List. This represents the whole of the present issued capital of the company.

Share List of Electrical Companies

	Nom.	Dividend. Previous.	Dividend. Last.	Price Sept. 20.	Rise or Fall.	Yield p.c. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	66/3	—	4 10 7
City of London	1	7½	7½	32/6	−6d.	4 12 4
Clyde Valley	1	7	8	36/-	−1/-	4 9 0
County of London	1	10½	10½	46/-	−1/6	4 11 4
Edmundson's 7% Pref.	1	7	7	32/-	−1/6	4 7 6
Do. Ord.	1	9	9	26/-	−6d.	—
Elec. Dis. Yorkshire	1	9	9	42/6	—	4 4 8
Elec. Fin. and Securities	1	12½	12½	50/-	—	5 0 0
Elec. Supply Corporation	1	11	12	53/9xd	−1/-	4 9 5
Lancs Light and Power	1	7½	7½	30/6xd	−1/-	4 18 4
Lond. Assoc. Electric	1	—	7	30/9	—	4 11 4
London Electric	1	8	7	34/-	−1/6	4 2 4
London Power Deb. Red.	Stock	5	5	103½	−1½	4 16 7
Metropolitan	1	10	12	47/6	−2/-	5 1 1
Midland Counties	1	8	8	37/6xd	−9d.	4 5 3
Mid. Elec. Power	1	8	9	40/9	—	4 8 3
North Eastern Electric Ordinary	1	7	7	30/6	−1/6	4 11 10
Do. 7% Pref.	1	7	7	32/-	−1/6	4 7 6
Northampton	1	10	10	46/3	—	4 6 7
Notting Hill 6% pref.	10	6	6	13¾	—	4 7 3
North Met. Elec. Ordinary	1	10	10	45/-	−⅛	4 9 0
Do. do. 6% Pref.	1	6	6	29/-	—	4 2 9
Scottish Power	1	8	8	36/-xd	−1/6	4 9 0
South London	1	7	7	31/6	—	4 9 0
Victoria Falls Ord.	1	12	13½	67/6	−$\frac{1}{16}$	4 0 0
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	17/6	—	8 11 6
Yorkshire Elec.	1	8	8	40/-	−1/-	4 0 0
PUBLIC BOARDS.						
Central Electricity, 1950–70	Stock	5	5	111	−2	4 10 1
Do. 1955–75	,,	5	5	114	−1	4 7 9
Do. 1951–73	,,	4½	4½	108½	−½	4 3 0
Do. 1963–93	,,	3½	3½	98	−2	3 10 0
London Elec. Trans. Gtd.	,,	2½	2½	87½	−3½	2 14 4
London & Home Counties, 1955–75	,,	4½	4½	111	−1½	4 1 1
London Passenger Transport, A.	,,	4½	4½	113½	−2	3 19 4
Do. do. B.	,,	5	5	117½	−2	4 5 1
Do. do. C.	,,	4	4½	75½	+½	5 12 7
West Midlands Joint Elec. 1948–68	,,	5	5	111	—	4 10 1
TELEGRAPH AND TELEPHONE.						
American Tel. & Tel.	$160	9	9	145½	—	6 3 8
Anglo-Am. Tel. Pref.	Stock	6	6	106	—	5 13 1
Do. Def.	,,	1½	1½	24	—½	6 5 0
Cable & Wireless 5½% Pref.	,,	4½	5½	88½	—	6 4 4
Do. Ord.	,,	—	4	40	—	10 0 0
Do. Income	,,	—	—	101½	—	3 18 8
Globe Tel. & Tel. Ord.	1	5½*	7½*	30/-	—	5 0 0
Do. do. Pref.	1	6	6	26/3	−$\frac{1}{16}$	4 11 5
Great Northern Tel.	10	20	20	40	—	5 0 0
Marconi-Marine	1	10	7½	23/9	−$\frac{1}{16}$	6 6 4
Oriental Telephone Ord.	1	12*	12*	57/6	—	4 3 8
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref.	5	Nil	Nil	3/9	−$\frac{1}{16}$	—
Do. do. 2nd Pref.	5	Nil	Nil	3/9	−$\frac{1}{16}$	—
Do. do. 5% Deb.	Stock	Nil	Nil	10	—	—
British Electric Traction Def. Ord.	,,	5	5	900	+25	—
Do. do. Pref. Ord.	,,	8	8	165	−5	4 17 0
Brazil Traction	$100	70 cts.	$1	11	−¼	—
Brit. Columbia Elec. Rly, Pfce.	Stock	5	5	100	—	5 0 0
Mexican Light Common	$100	Nil	Nil	1	—	—
Do. do. 1st Bonds	500	5	5	22½	—	—
West Riding	1	6½	10	32/6	—	—
MANUFACTURING COMPANIES.						
Aron Electricity Ord.	1	15	15	1 1/16	—	8 17 6
Assoc. Elec. Ord.	1	10	10	35/6	−1/6	5 12 8
Do. Pref.	1	8	8	37/-	—	4 6 6
Babcock & Wilcox	1	10	10	36/3	—	5 10 4
British Aluminium Ord.	1	10	12½	49/6	+9d.	5 1 3
British Insulated Ord.	1	20	20	4¾xd	+9d.	4 11 4
Brush Ord.	5/-	Nil	Nil	5/-	−3d.	—
Callender's	1	20	20	4½	−½	4 9 0
Do. 6½% Pref.	1	6½	6½	31/3	—	4 2 4
Crompton Parkinson Ord.	5/-	12½	12½	23/9	−⅛	—
Do. 8% Pref.	1	8	8	37/6	—	4 5 4
Electric Construction	1	10	12½	33/9	—	7 8 0
Enfield Cable Ord.	1	25	25	2½	−½	—
English Electric	1	Nil	10	29/-	−6d.	6 18 0
Do. Do. Pref.	1	6½	6½	25/6xd	—	5 2 0
Ericsson Tel.	5/-	25	25	37/6	—	3 6 8
Ever Ready	5/-	45	35	18/-	—	9 14 6
Ferranti Pref.	1	7	7	27/6	—	5 2 0
G.E.C. Pref.	1	6½	6½	32/6	—	4 0 0
Do. Ord.	1	17½	20	76/6	—	5 4 7
Henley's	5/-	15	20	20/-	—	5 0 0
Do. 4½% Pref.	1	4½	4½	22/6	—	4 0 0
India-Rubber Pref.	1	5½	5½	21/3xd	+6d.	5 3 6
Johnson & Phillips	1	10	12½	38/3	—	6 11 0
Lancashire Dynamo	1	20	25	55/-xd	−2 6	9 2 0
Siemens Ord.	1	7½	7½	23/3	—	6 9 0
Telegraph Construction	£1	7½	10	2½	—	4 9 0

* Dividends are paid free of Income Tax.

New Patents

Electrical specifications recently published

Compiled by a firm of chartered patent agents. The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 23, Southampton Buildings, London, W.C.2.

1936

4997. "Overhead trolley-gear of electrically propelled trackless vehicles." A. W. Mawer. August 18th, 1937. (490952.)

31633. "Electric brake regulating devices for spinning and twisting machines." M. Nickel. November 18th, 1936. (Convention date not granted.) (490923.)

31821. "Television device." Radioakt-Ges. D. S. Loewe. November 22nd, 1935. (Cognate application 31822/36.) (490924.)

31986. "Method of control for electric vehicles, lifts, cranes and the like." L. Murphy. November 23rd, 1936. (490926.)

32005. "Electric motor control systems." Igranic Electric Co., Ltd., and J. R. Taylor. November 23rd, 1936. (490857.)

1937

1729. "Television transmitting systems." W. S. Percival, C. O. Browne, L. R. J. Johnson and F. Blythen. January 20th, 1937. (490845.)

1922. "Potentiometers." A. O. Henton and A. F. Drewett. January 22nd, 1937. (490849.)

2171. "Electron multiplier." British Thomson-Houston Co., Ltd. January 23rd, 1936. (491069.)

2178. "Electric circuits supplying electric-discharge devices." General Electric Co., Ltd., and V. J. Francis. January 25th, 1937. (491070.)

2939. "Electric circuits containing transformers operating high-pressure mercury-vapour electric-discharge devices." General Electric Co., Ltd., and V. J. Francis. February 1st, 1937. (Cognate applications 35376/37 and 35377/37.) (491071.)

3956. "Apparatus making possible the permanent recording automatically of oral telephone conversations." P. F. Taylor. February 10th, 1937. (491010.)

5044. "Television apparatus." A. M. Low. February 19th, 1937. (491011.)

5056. "Light-reflectors." British Thomson-Houston Co., Ltd. February 21st, 1936. (491012.)

5068. "Electrical signalling systems." Automatic Telephone & Electric Co., Ltd., P. N. Roseby and J. F. Mackenzie. February 19th, 1937. (490936.)

5226. "Electric incandescent lamps." General Electric Co., Ltd. (Patent-Treuhand-Ges. für Elektrische Glühlampen.) February 22nd, 1937. (491073.)

5412. "Radio direction-finding apparatus." Standard Telephones & Cables, Ltd., and C. W. Earp. February 23rd, 1937. (490940.)

5490. "Electric battery lamps for use with lifebelts." A. H. Double. February 24th, 1937. (491078.)

5562. "Elektron-discharge devices for use in television and like systems." Fernseh Akt.-Ges. February 24th, 1936. (491020.)

5578. "Telephone systems." Telephone Manufacturing Co., Ltd., and J. G. Flint and L. E. Ryall February 24th, 1937. (491022.)

5597. "Electric switches employing conducting liquid." A. Cianchi. February 24th, 1937. (Cognate application 19150/37.) (490946.)

5690. "Methods of dynamic braking of electric motors." British Thomson-Houston Co., Ltd. February 26th, 1936. (490948).

5816. "Microphones or electromechanical translating devices of the carbon granule or like type." J. L. Minto, A. Tutchings and J. A. McIntosh. February 26th, 1937. (491216).

5857. "Antenna systems for radio-receiving systems." E. V. Amy and J. G. Aceves. February 26th, 1937. (491220).

5871. "Electromagnetic door-locking system." E. Rautek. February 28th, 1936. (491024).

5882. "Variable inductances and transformers for radio transmitters and receivers." L. W. Meyer (P. R. Mallory and Co., Inc.). February 26th, 1937. (491222.)

5895. "Fluorescent materials for electric-discharge tubes." Franco-British Electrical Co., Ltd., and A. H. Brackensey. February 26th, 1937. (491224.)

5962. "Electrical control systems for presses." H. F. MacMillin. August 24th, 1936. (491160.)

6074. "Electric valve converting systems." British Thomson-Houston Co., Ltd. February 29th, 1936. (491092.)

6126. "Modulated carrier-wave signalling systems." P. P. Eckersley and R. E. H. Carpenter. March 1, 1937. (491093.)

6144. "Systems for signalling over power mains." Ericsson Oesterreichische Elektrizitäts-Akt.-Ges. Vorm Deckert and Homolka. February 29th, 1936. (491028.)

6607. "Electric-discharge lamps." British Thomson-Houston Co., Ltd., H. Cheney and C. Gilson. March 5th, 1937. (491096.)

6790. "Operating mechanism for electric switchgear." General Electric Co., Ltd., and F. J. Keeley. March 8th, 1937. (490859.)

7226. "Protection of transformer windings from overvoltages." Siemens-Schuckertwerke Akt.-Ges. January 30th, 1937. (490860.)

8849. "Machines for sealing incandescent electric lamps and similar articles." British Thomson-Houston Co., Ltd. March 26th, 1936. (490864.)

10063. "Electromagnetically operated vacuum or gas-filled electrical switches." Sun-Vic Controls, Ltd. (Birka Regulator Ges.). April 8th, 1937. (490867.)

10385. "Electric frequency-changing apparatus." General Electric Co., Ltd., and D. A. Ley. April 12th, 1937. (491103.)

10766. "Electric-discharge devices." British Thomson-Houston Co., Ltd. April 16th, 1936. (490868.)

11148. "High-pressure mercury-vapour electric-discharge lamps." General Electric Co., Ltd., and V. J. Francis. April 19th, 1937. (491104.)

12282. "Securing-means for electric circuit elements." Steatit-Magnesia Akt.-Ges. April 29th, 1936. (490870.)

13019. "Electric ceiling-fans." General Electric Co., Ltd., and H. C. E. Jacoby. May 6th, 1937. (Addition to 354681.) (490962.)

13425. "Electric cables for trunk communication, particularly submarine cables." Siemens & Halske Akt.-Ges. May 12th, 1936. (491105.)

14069. "High-pressure metal-vapour electric-discharge devices." General Electric Co., Ltd., V. J. Francis, and M. Pirani. May 20th, 1937. (491176.)

17161. "Telegraph printers." K. Gundlfinger. June 19th, 1937. (491044.)

19922. "Electric generators." Wico Electric Co. November 19th, 1936. (491110.)

20351. "Electric motors." British Thomson-Houston Co., Ltd. July 22nd, 1936. (490875.)

21033. "Thermionic cathodes for electric-discharge devices." General Electric Co., Ltd., and A. G. Pearce. July 29th, 1937. (491179.)

21492. "Electric contact-making relays." H. Greenly. August 4th, 1937. (Addition to 473589.) (491114.)

21949. "Winding means for the controlling ropes of the conductor-trollies of electrically propelled vehicles." C. L. Delachaux. June 1st, 1937. (490970.)

22564. "Cathode-ray tubes, especially for television." E. Michaelis. August 28th, 1936. (491050.)

25110. "Electrostatic apparatus, for relays and the like." E. Lewin. September 27th, 1937. (490879.)

27988. "Automatic switch mechanism for through-flow electric water heaters." C. H. Groth-Nuennke. October 14th, 1936. (490976.)

28780. "Electric hot-plates." E. Challet, and Entreprises Electriques Fribourgeoises. January 13th, 1937. (490880.)

29182. "Electric signal amplifiers." L. E. Ryall. October 26th, 1937. (491126.)

29664. "Radio direction-finders." Telefunken Ges. für Drahtlose Telegraphie. October 29th, 1936. (491127.)

30383. "Arrangements for supervising the operation of wireless antenna structures." C. Lorenz Akt.-Ges. November 7th, 1936. (491129.)

31892. "High-tension electric insulators." C. Lorenz Akt.-Ges. November 24th, 1936. (490884.)

32714. "Method of and apparatus for producing light modulations by means of modulated electron beams." Zeiss Ikon Akt.-Ges. January 18th, 1937. (490981.)

33093. "Radio receivers having variable selectivity." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. December 3, 1936. (491183.)

33849. "Electric resistances." British Thomson-Houston Co., Ltd. December 8, 1936. (490889.)

35685. "Arrangements for modulating high-frequency oscillations." C. Lorenz Akt.-Ges. December 23, 1936. (490990.)

1938

536. "Means for the generation of impulse voltages." British Thomson-Houston Co., Ltd. January 8th, 1937. (490993.)

1781. "Electrical measuring instruments." General Motors Corporation September 20th, 1937. (490901.)

2808. "High-frequency signalling systems or apparatus." Standard Telephones & Cables, Ltd. March 30th, 1937. (Addition to 468548.) (491196.)

4479. "Manufacture and installation of super-tension electric cables." W. Brown. February 12th, 1938. (491200.)

5144. "Means for controlling a contact device by a measuring apparatus." Landis & Gyr Akt.-Ges. March 18th, 1937. (491202.)

5347. "Electric-discharge devices." Westinghouse Electric & Manufacturing Co. February 20th, 1937. (491058.)

5424. "Mercury cathodes for use in electrolysis." I. G. Farbenindustrie Akt.-Ges. March 20th, 1937. (490911.)

6570. "Electrolytic condensers." Naamlooze Vennotschap Philips' Gloeilampenfabrieken. March 5th, 1937. (490914.)

8420. "Flash-lamps." British Thomson-Houston Co., Ltd. March 18th, 1937. (491206.)

10782. "Lamps." J. Pintsch Akt.-Ges. January 30th, 1936. (Divided out of 490933.) (491062.)

11474. "Electric gas-discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. April 19th, 1937. (491208.)

11757. "Circuits comprising electric discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken." April 21st, 1937. (491063.)

12109. "Electric valve-circuits." British Thomson-Houston Co., Ltd. April 24th, 1937. (491064.)

14608. "Electric brake regulating apparatus for spinning or twisting machines." M. Nickel. November 19th, 1935. (Divided out of 490923.) (Cognate application 22691/38.) (491003.)

The Wiring of "Dingley Dell"

Cobtree Manor, Maidstone, the "Dingley Dell" of "Pickwick Papers," now has an electrical installation, with 64 points, wired with Callender's 250-V grade cable in plain brazed conduit by Messrs. Haynes Bros., Ltd., of Maidstone. Supply is by the Maidstone Corporation Electricity Department. Previously the house was lit by acetylene gas from a private plant installed by the same firm 35 years ago, and more recently by company's gas. The oldest part of the Manor is Tudor, and an addition was built 250 years ago comprising drawing-room and library, in each of which are mantelpieces designed by Inigo Jones and carved from Bethersden stone, which were originally in Teynham Castle. In the older part of the house the present dining-room was the kitchen mentioned in "Pickwick Papers," where Mr. Pickwick and his friends dried their clothes after immersion in the lake when the ice gave way.

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Accrington.—September 23rd. Electrical installation at High School. S. Wilkinson, county architect, County Offices, Preston (deposit £2).

Australia.—MELBOURNE.—October 4th. Posts and Telegraphs Department. Underground cable. (T. 26684/30.)* Relays for operation on a 24-V d.c. circuit. (T. 26685/38.)*

VICTORIA.—October 18th. State Electricity Commission. Steel cored aluminium conductors and sleeves for twelve months. (T.Y. 26700/38.)*

Birmingham.—October 19th. Airport Committee. Installation of aerodrome lighting, erection of equipment and switchgear and laying of cables at Elmdon Airport. (September 9th.)

Chester.—September 26th. City Council. Electrical wiring at the City and County School extensions and new buildings. (September 9th.)

October 17th. County Council. Electrical installation comprising electric lighting and power services, electric lifts, tubing for internal telephones, watchmen's tell-tales, electric clocks, &c., at the new County Offices. Clerk of the County Council, County Offices, St. John's House (deposit £10).

Chile.—SANTIAGO.—September 30th. Agricultural Export Board. Two vertical elevators. (T.Y. 26715/38.)*

Coventry.—October 10th. Corporation. Pumping plant comprising two electrically driven borehole pumps, electric control equipment and all accessories. F. Smith, Town Clerk, Council House (deposit £3).

Dublin.—September 23rd. Commissioners of Public Works in Ireland. Field lighting equipment comprising neon beacon, boundary lights, floodlights, illuminated wind tee, ceiling projector and indicator, wind speed indicator, airport traffic signal, control desk and switchgear. G. P. Fagan, secretary, Office of Public Works (deposit £2).

East Grinstead.—September 30th. U.D.C. A.c. and d.c. house service meters during the period ending March 31st, 1940. (September 16th.)

Egypt.—September 29th. Municipalities Department. One h.v. feeder between the electric power station and Kiosque Ahnouh at Assiut. (T. 26442/1938.)*

CAIRO.—October 6th. Four 25-kVA three-phase transformers. (T. 26668/38.)*

Folkestone.—October 4th. Corporation. Electrical wiring of ninety-two houses to be erected near Shaftesbury Avenue. (See this issue.)

Guernsey.—October 5th. Waterworks Department. Multi-stage centrifugal pumps, electric motors and appurtenant works at the Marais Stream and Vale Pond pumping stations. W. H. Morgan, engineer and manager (deposit £2).

India.—CALCUTTA.—November 29th. Indian Stores Department. A.c. ceiling fans for twelve months. (T. 26200/38.)*

December 6th. D.c. ceiling fans for twelve months. (T.Y. 26196/38.)*

January 10th. A.c. and d.c. table fans for twelve months. (T. 26198/38.)*

MADRAS.—October 19th. Electricity Department. Mettur hydro-electric scheme extensions: Sixteen miles of 33-kV 0.03 sq. in. copper single-circuit line from Chittoor to Pakala. Nineteen miles of 11-kV 0.03 sq. in. copper single-circuit line from Pakala to Chandragiri. (T. 26699/1938.)*

SIMLA.—October 4th. Indian Stores Department. 660-V cables and pot-heads for the East Indian Railway. (T. 26903/38.)*

Iraq.—BAGHDAD.—November 6th. Directorate General of Posts and Telegraphs. One automatic 5,000 line switchboard. (September 16th.)

Leyton.—October 17th. Corporation. Installation of electric lighting in proposed new library and lock-up shops, Harrow Green, E.11. (September 16th.)

London.—SOUTHWARK.—September 26th. Borough Council. Electric cables for twelve months. (September 9th.)

COMMISSIONERS OF H.M. WORKS.—October 14th. Turbo-alternators and auxiliaries at Pembrey R.O.F. and Bridgend R.O.F., and switchgear, &c., for power station at Bridgend R.O.F. (September 16th.)

September 26th. One second-hand three-phase 400-V alternator coupled to Diesel engine for the Pembrey R.O.F. (September 16th.)

Malden and Coombe.—September 26th. Town Council. Pumps, motors, pipework and switchgear for the Kingston Vale pumping station. A. R. Goldthorp, borough engineer, municipal offices, New Malden, Surrey.

Manchester.—September 26th. Electricity Committee. One emergency control board for 33-kV switchgear at Barton power station.

October 3rd. 6,600-V and 400/230-V overhead and underground transmission system and pole sub-station equipment. (September 16th.)

October 3rd. Electricity Department. One traction battery. (See this issue.)

Melford.—September 28th. R.D.C. Electrically driven vertical-spindle centrifugal borehole pumps for the pumping station in course of erection at Great Cornard. Sands & Walker, Milton Chambers, Milton Street, Nottingham (deposit £2 2s.).

Midlothian.—September 30th. Twelve months' stores, including electrical fittings, for the Midlothian and Peebles District Asylum, Rosslynlee. Chilton L. Addison-Smith, clerk and treasurer, 19, Heriot Row, Edinburgh.

Newcastle-on-Tyne.—City Council. Electric lighting of the hangar at the Woolsington municipal airport. City engineer, Town Hall.

Newport.—October 17th. Electricity Department. One electrically driven circulating water pump, switchgear and water-screening plant. (September 16th.)

New Zealand.—WELLINGTON.—November 15th. Public Works Department. Four 750-kVA units for transformer bank and spare at Tahekeroa sub-station (Arapuni—Section 615). (T. 26615/38.)*

October 25th. Posts and Telegraph Department. 4,000 yd. of flexible wire. (T. 26346/38.)*

October 6th. Conduits for lead-covered telephone cables. (T.Y. 26621/38.)*

Northallerton.—October 12th. North Riding Education Committee. Installation of electric lighting and power at the new high school for girls, Richmond, Yorkshire. F. Barraclough, secretary, Education Offices, County Hall.

Northern Ireland.—BELFAST.—October 7th. Electricity Department. Reconstruction of existing 6.6-kV armourclad switchgear. (See this issue.)

Plymouth.—October 7th. Corporation. 33,000-V metal-clad switchgear, isolating units and control panels.

October 12th. Two 100,000 lb./hr. boilers with buildings and auxiliary equipment. (September 9th.)

Salford.—September 27th. Electricity Department. Rubber insulated cables. (September 9th.)

South Africa.—PRETORIA.—October 13th. Union Tender and Supplies Board. Motor-driven ringing generators for a.c. supply. (T. 26531/1938.)*

September 29th. One 7½-kW 110-V Diesel engine-driven electric lighting plant. T. 26527/1938.)*

October 4th. Electric Supply Department. E.h.v. ring main units, l.v. switchgear, p.i. cables and power transformers. (T. 26757/1936.)*

October 6th. Public Works Department. Refrigerating plant and a water cooling unit for the Poison Extraction Laboratory, Onderstepoort. (T.Y. 26756/1938.)*

CAPE TOWN.—October 10th. Electricity Department. E.h.v. line material. October 18th. Circuit-breakers. (T.Y. 26383/38.)*

October 10th. Pole mounting core type transformers. (T.Y. 26749/38.)*

JOHANNESBURG.—October 24th. Railways and Harbours Administration. Superheater elements for boilers. (T. 26597/38.)*

PORT ELIZABETH.—October 13th. City Engineer's Department. Electric fans. (T. 26742/38.)*

Southern Rhodesia.—SALISBURY.—October 6th. Electrical Department. Machine tools and an electric welding set. (T.Y. 26375/38.)*

Tunbridge Wells.—October 3rd. Corporation. Electrical installation at new Assembly Hall. (See this issue.)

Wakefield.—September 26th. West Riding County Council. Installation of electric lighting in the extensions at Dinnington senior council school. Clerk of the County Council, County Hall.

October 3rd. Electric lighting installation at extensions of Ryhill senior school. Sir J. Charles McGrath, clerk to the Council.

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* Further particulars from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Brighton.—Electricity Committee. Accepted. Two 250-kVA transformers for Beechwood Avenue sub-station.—G.E.C. Two 250-kVA transformers for Coombe Road sub-station.—Foster Engineering Co. Submarine electricity cables for Shoreham Harbour.—Siemens Bros. Filtering, electric water heating and air-washing plant for gas-proof chambers at Southwick power station (£850).—Utilities (London). (Extension of contract.).

Corporation. Accepted. Electrical installation in "A" block, Elm Grove Home.—Page & Miles.

Health Committee. Accepted. Electric kitchen mixer for the Municipal Hospital (£161).—Lancashire Dynamo & Crypto.

Bromyard.—U.D.C. Accepted. Electrical installation in new council houses at Hereford (£130).—Drake and Gorham.

Consett.—U.D.C. Accepted. Electric lighting installations in 765 houses.—Graham Berrie.

Dundee.—Town Council. Accepted. Extensions at Carolina Port generating station (£32,152).—B.T.H. Co.

East Ham.—Works Committee. Recommended. Electrical installation at Harts Sanatorium: Wiring (£885).—City Electrical Co. Stage lighting equipment (£107).—Strand Electrical & Engineering Co. Radio equipment (£50).—Harmer & Simmons.

Glasgow.—Housing Committee. Accepted. Electrical installations in 123 houses at Deanston Drive (£1,041).—J. Stuart Denholme.

Education Committee. Accepted. Electrical work at King's Park School (£1,176).—Scottish Co-operative Wholesale Society.

Hertford.—East Herts Joint Hospital Board. Accepted. Electrical installation at the Hertford Hospital (£1,227).—L. G. Bland.

Ipswich.—Electricity Committee. Accepted. L.v. traction switchboard (£736).—J. G. Statter & Co.

London.—L.C.C.—Accepted. Wiring and fittings for electric lighting, &c.: Three blocks of dwellings at Herbrand Street, Holborn (£1,127).—Newman & Watson. Fifteen blocks of dwellings, Barnfield Road area, Woolwich (£1,616).—Archibald Meckhonik. Two blocks of dwellings, Darcy Buildings and Valette Buildings, Hackney (£918).—Holliday & Son (Elec-

trical). One block of dwellings in Garden Street area, Camberwell (£911).—Samuel Reed & Sons. One block of dwellings in Warburton Square area, Hackney (£841).—Holliday & Son (Electrical). Wix's Lane School (£1,038).—Newman & Watson. Battersea Central School (£1,495).—Pinching & Walton. Durham Hill School (£1,043).—G. Hopkins & Sons. Hugh Myddelton School (£1,564).—Alexander Hawkins & Sons. Wiring and fittings for alterations and additions to the electric lighting, &c., in four ward blocks at St. Nicholas' Hospital, Plumstead (£563).—Pinching & Walton. Provision and erection of an electric bed lift in block Q.R.S. at St. Andrew's Hospital, Bow (£952).—Etchells, Congdon & Muir.

ST. PANCRAS.—Contracts and Stores Committee. Recommended. Electrical wiring at the Prince of Wales Road Baths (£865).—Thos. H. Smerdon. 100 steel tubular street lighting standards (£1,107).—Bromford Tube Co. Modification of two switchboard panels to improve the distribution system between the power station and Regent's Park sub-station (£141), and h.v. switchgear for Bartholomew Road sub-station (£294).—A. Reyrolle & Co.

Portsmouth.—Contracts Committee. Accepted. 500 lamp brackets (£5,725).—Wardle Engineering Co.

Stockton.—Town Council. Accepted. Outram Street sub-station: Transformers.—Bonar, Long. Switchgear.—A. Reyrolle & Co.

Sunderland.—Town Council. Accepted. Installation of two turbo-alternators at the Hylton Road generating station (£420 each).—Fraser & Chalmers.

Swansea.—Electricity Committee. Accepted. Switchgear for Strand sub-station (£720).—Pridmore & Co.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Aberdare.—Cinema, High Street; W. E. Willis, architect, Globe Buildings, Penylan, Cardiff.

Accrington.—Extensions to premises for William Moseley, Ltd., The Borough Bakery, Jacob Street.

Alloa.—Additions to technical school (£10,000); burgh surveyor.

Birmingham.—Factory for the Premier Plating Co., Great Hampton Row; C. Twigg & Son, builders, Theodore Street, Birmingham.

Bishop Auckland.—Houses (48), Ashcroft Gardens; U.D.C. surveyor.

Blackpool.—Rebuilding of hotel, Dickson Road; Atherton Bros., Ltd., builders, Peter Street Saw Mills.

Bootle.—Alterations and additions to General Hospital; governors.

Bournemouth.—Shops and flats, 31-2, Castle Lane; J. C. Wilkinson & Son.

Bridlington.—Houses (104); R.D.C. surveyor.

Brighton.—Houses (157), Carden Avenue, and two blocks of flats, Warwick Street; borough surveyor. Cinema, North Street; Southern Counties Cinemas, Ltd. Three blocks of flats, Dyke Road; Bleak House Development Co. Premises, St. George's Road; Edlins, Ltd. Factories, East Moulsecoomb; Allen West & Co., Ltd. Alterations to Hippodrome, Middle Street; Gaumont British Picture Corporation, Ltd. Bungalows (18), Larkfield Way, Withdean; E. Sheppard. Shops, flats and offices, Marine Drive; Riflebutt Properties, Ltd.

Burslem.—Extensions to factory, High Street, for Wade Potteries, Ltd.; R. T. Longden, 10, King Street, Newcastle, Staffordshire.

Cannock.—Houses (28), Mount Street, Hednesford, for the U.D.C.; B. Denning, contractor, Birmingham Road, Walsall.

Carlton.—Shop premises, for Netherfield Co-operative Society, Ltd., Victoria Road; Bright & Thoms, architects, 9, St. Peter's Church Walk, Nottingham.

Coventry.—Block of shops and offices fronting Broadgate, for George Loveitt & Son; J. G. Gray & Son, builders, Broad Street. School, Hill Farm estate; education architect, Council House.

Douglas (I.O.M.).—Concert hall, Cunningham's Camp; Mrs. E. H. Cunningham.

Durham.—Extensions to Ryton intermediate school (£8,000), improvements to Flint Hill school (£3,500), and alterations to Brandon school, for the County E.C.; F. Willey, architect, 34, Old Elvet.

East Ham.—Maternity ward, Memorial Hospital; governors.

Edinburgh.—Cinema, 14, Bath Street, Portobello (£20,000); T. Bowhill Gibson, architect, Edinburgh. School, Gogarburn Institution, for the Corporation; city architect.

Felling-on-Tyne.—Houses (50), Windy Nook, for the U.D.C.; housing architect. Library, Gallaghers Corner; U.D.C. surveyor.

Fourstones (NORTHUMBERLAND).—Houses (20); W. Dixon & Son, architects, 1, Collingwood Street, Newcastle-on-Tyne.

Gateshead.—Houses, Shipcote estate; S. Thompson, builder. 36, Ashtree Gardens.

Glamorganshire.—School, Llandridian (£23,167), for the County E.C.

Glasgow.—Houses (128). Deanston estate; housing director and trade contractors. Houses, Hillingdon and North Cardonald; housing director. Bank, Dalmarnock Road; National Bank of Scotland, Ltd. Cinema, Olympia Street; Cinema Constructions, Ltd. School (£80,000), Garngad Road; Miller and Black, architects, 132, West Regent Street. Additions to Kelvindale Paper Mills; Associated Paper Mills, Ltd. Extensions to bakery, Dalton Street; Price Bros. (Bakers), Ltd. Extensions to Larkfield garage (£56,000); city engineer and trade contractors. Extensions to Riverbank Works, Riverford Road; Brown & Adam, Ltd. Reconstruction of premises, Cook Street and Commerce Street; George G. Kirk, Ltd.

Gorleston-on-Sea.—Shops and restaurant, Beach Road; Keiffer & Richards.

Grangetown (YORKSHIRE).—Cinema; S. Baggott, builder, West Hartlepool.

Hull.—Office block, George Street, for Royal London Mutual Insurance Co., Ltd., Royal London Buildings, Prospect Street; Markwell, Holmes & Hayter, Ltd., contractors, 198, Albert Avenue.

Ipswich.—Schools, Sidegate Lane, Springfield; G. A. Kenney & Sons.

King's Lynn.—Cinema, Pilot Street; C. D. Allflatt, contractor, Windsor Road.

Lanark.—Swimming baths (£24,000) for T.C.; burgh surveyor.

Leeds.—Factory, for Jacksons, Ltd., Newcastle-on-Tyne; W. T. Pearson, Ltd., contractors, Sheepscar Grove, Leeds.

Leicester.—Houses (180), Station Road, Thurnby; B. W. Cole, builder, Bridge Road Works.

Liverpool.—Houses (44), Lisleholme Road; Irving & Mosscrop, architects, Stanley Street. Factory premises, Speke Hall Road, for Clarke Bros., Ltd., Park Works, Gorsebank Road; J. Jones (Woolton), Ltd., contractors, Higher Road, Hunt's Cross. Offices, Tithebarn Street, for the Legal & General Assurance Society, Ltd.; Quiggin & Gee, architects, 24, North John Street.

London.—(ST. PANCRAS).—Refuse destructor (£155,316); Heenan & Froude, Ltd. Rebuilding Ear, Nose and Throat Hospital, Fitzroy Square; governors. (E.C.).—Extensions, Central Foundation School for Girls, Spital Square; governors.

Manchester.—Cinema, Oxford Street and Portland Street, for Chepstow Street Development Co., Ltd., 20, Victoria Street; Verity & Beverley, architects, 32, Old Burlington Street, London, W.1. Cinema and house, Thorp Road, Newton Heath, for C. A. Wilkinson; Donald Macdonald, Ltd., contractors.

Newburn-on-Tyne.—Houses, Chapel House estate and West Denton estate; R. Burke, architect, Singleton House, Northumberland Road, Newcastle-on-Tyne.

Northallerton.—Cinema; Marshall, Tweedy and Bourn, architects, Grainger House, Blackett Street, Newcastle-on-Tyne.

Northwich.—Cinema, London Road, for David Forrester Theatres, Ltd., Midland Bank Chambers, Cross Street; Joseph H. Cassel & Co., contractors, 297, Bury New Road, Broughton, Manchester.

Norwich.—Development of housing estate; city engineer.

Portsmouth.—Premises, Fratton Road, for Portsea Island Mutual Co-operative Society, Ltd.

Redcar.—Houses (46), Council estate; Croskell & Sons. Central fire station; borough engineer.

Silksworth (CO. DURHAM).—Sports stadium; Marshall, Tweedy and Bourn, architects, Grainger House, Blackett Street, Newcastle-on-Tyne.

Somerset.—Schools, Huish (£38,058), and Stoke-under-Ham, for the County E.C.

Southampton.—School, Middle Road (£34,063), for the E.C.

Spenborough.—Houses (86), Firthcliffe estate; U.D.C. surveyor.

Stanley (CO. DURHAM).—Public library; F. Willey, 34, Old Elvet, Durham City.

Stretford.—School, Lostock; P. Howard, architect, 88, Mosley Street, Manchester.

Swansea.—Houses (20); J. C. Oliver, Plasmarl. Houses (28), Grange Road; Picton Developments, Ltd. Bus station, Singleton Street; United Welsh Services, Ltd.

Tipton.—Houses (404), Upper Church Lane; housing architect, Council House.

Turton.—Houses (52), Eagley; R. Dart, U.D.C. surveyor.

Tynemouth.—Houses, in connection with clearance plans for the T.C.; borough engineer.

Warrington.—Houses (62), Charter Avenue; Greenwood Bros.

Warwick.—Cinema, Market Place, for the Avion Cinema Co., Birmingham; R. Satchwell, architect, 6, New Street, Birmingham.

Wembley.—Houses (61), Church Lane; borough engineer.

Wigan.—Houses (50), Mulgrave, Chiswell and Conway Straits; Massey Bros., builders, Enfield Street, Pemberton.

Wincanton.—Houses (50); R.D.C. surveyor.

Woodford.—Houses (300), Roding Farm estate; Estate Co.

York.—School, Margaret Street; St. Georges R.C. trustees. Alterations and additions to Knavesmire and Shipton Street schools; city architect.

Information Department

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, &c., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

PIXIE dish-washing machine.